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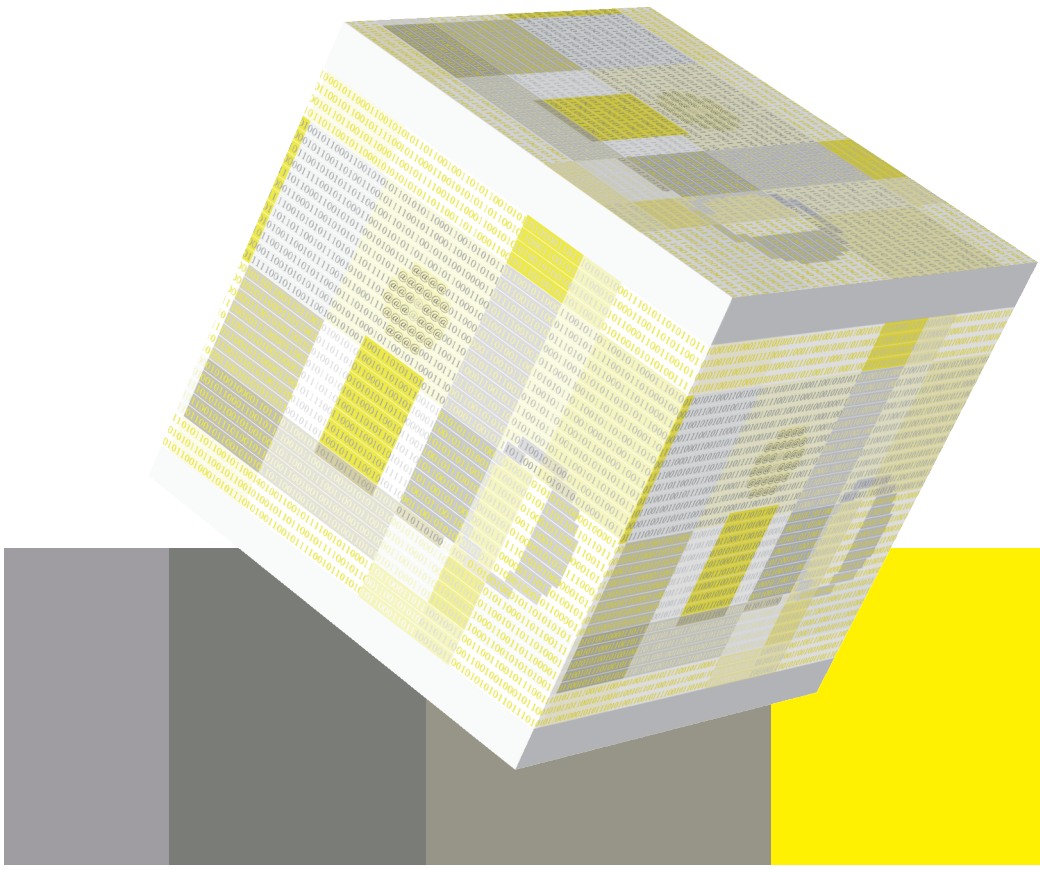

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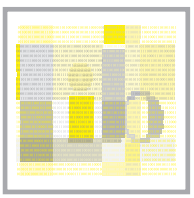

教育資料與圖書館學，始於1970年3月創刊之**教育資料科學月刊**，其間於1980年9月更名為**教育資料科學**，並改以季刊發行。自1982年9月起易今名。另自2016年11月起，改以一年出版三期（3月、7月、11月）。現由淡江大學出版中心出版，淡江大學資訊與圖書館學系和覺生紀念圖書館合作策劃編輯。本刊為國際學術期刊，2008年獲國科會學術期刊評比為第一級，2015年獲科技部人文社會科學研究中心評定為教育學門專業類一級期刊。並廣為海內外知名資料庫所收錄(如下英文所列)。

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The *JoEMLS* is an Open Access (OA) Dual, double-blind reviewed and international scholarly journal dedicated to making accessible the results of research across a wide range of Information & Library-related disciplines. The *JoEMLS* invites manuscripts for a professional information & library audience that report empirical, historical, and philosophical research with implications for librarianship or that explore theoretical and practical aspects of the field. Peer-reviewed articles are devoted to studies regarding the field of library science, information science and IT, the book trade and publishing. Subjects on instructional technology and information communication, pertaining to librarianship are also appreciated. The *JoEMLS* encourages interdisciplinary authorship because, although library science is a distinct discipline, it is in the mainstream of information science leading to the future of **InfoLibrary**.

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Editorial

Innovative Applications of Transparency Regulations for Disclosing the Roles of Contributors in Scholarly Journals and the Utilization of AI Tools

Following the release of the first version of the *Guidelines on Self-Disclosure and Integrity in the Use of Generative AI* at the end of 2025, the *Journal of Educational Media & Library Sciences* (*JoEMLS*) has proactively invited authors of pending manuscripts to participate in the journal's recommended AI disclosure items on a voluntary basis. This initiative aims to bridge the gap between the submission time of current manuscripts and the announcement of the initial "Integrity Principles".

Beginning with the second issue of Volume 63 of this journal (July 2026), we will invite authors of accepted but unpublished manuscripts to participate in a trial for a more detailed disclosure of individual authors in accordance with the revised (second) edition of the "Self-Disclosure and Transparency Regulations for the Use of Generative AI" (hereinafter referred to as the "New Regulation"). For new submitting authors, adherence to these new specifications will be explicitly required to ensure the comprehensive implementation of the New Regulation starting with the first issue of Volume 64 (2027).

This New Regulation combines the internationally established CRediT (Contributor Role Taxonomy) for contributor roles with existing AI-related guidelines in academic publishing (such as AI referencing styles recommendations in APA, Chicago/Turabian styles). It further incorporates three distinct facets in its design. *JoEMLS* calls this the AIxCRediT model, which includes:

- Contributor Role (CRediT facet): Disclose each author's specific human contributions during the research and writing process (14 defined roles).
- AI Disclosure/Assistance Taxonomy (AIDAT facet): Disclose each author's use of AI tools during the research and writing process (9 categories).[1]
- AI–Author Engagement Level: Disclose the depth of the author's interactive engagement when completing each task under the AIDAT

[1] The *JoEMLS* AI Disclosure/Assistance Taxonomy is divided into 9 items: A1 Conceptualization & Design; A2 Literature Retrieval, Data Management & Analysis; A3 Literature Review and Synthesis (incl. literature translation and excerpts); A4 Statistical Analysis & Visualization; A5 Drafting & Structure, A6 Readability, Proofreading, Paraphrasing, and translation; A7 Citation & Reference Management; A8 Review Communication, Ethics & Compliance Check; A9 Dissemination and Outreach, Figure & Multimedia Generation.

categories using AI tools; conversely, this can be seen as the level of assistance provided by the AI to the author (5 levels). Thus, it serves as a disclosure of the degree of human–machine interaction involved.

The CRediT taxonomy currently used by international journals lists 14 roles.[2] It provides author teams with descriptions of different contribution types to the work, thereby clarifying the precise attribution of responsibilities among co-authors and enhancing transparency in academic ethics. For example, Elsevier notes that CRediT further clarifies: (1) the corresponding author is responsible for ensuring that descriptions (of contributions) are accurate and agreed upon by all authors; (2) contributions should be responsibly expressed according to the CRediT roles; (3) authors may contribute to multiple roles; and (4) CRediT does not attempt to change or intervene in how authors qualify one another.[3] In practice, CRediT typically requires authors to explicitly declare and list their contributions upon manuscript submission. Unfortunately, CRediT's strengths still have limitations, especially in today's AI-driven context: it has not defined the correspondence between AI usage and scholarly output, nor has it imposed any ethical constraints on how the 14 roles relate to author order, relying instead on the decisions of the author group. In other words, self-discipline and self-respect remain the indispensable guiding principles.

Considering these circumstances, our journal's proposed AIxCRediT system has been conceived. This AIxCRediT model constitutes a "dual-aspect, three-dimensional" framework intended to clarify the attribution of responsibilities under human–AI co-creation, rather than arbitrarily restricting cases of reasonable, prudent, and responsible AI tool usage. Overall, the AIxCRediT model has the following features:

1. Detailed transparency: Provides more granular disclosure than simply stating "AI was used," so that co-authors are aware of their individual responsibilities and division of labor, and readers clearly understand the specific parts of the research process in which AI was involved.
2. Accountability: Reinforces that human authors bear ultimate responsibility for every research step, even if that step was assisted by AI.
3. Standardization: Provides journal editors and reviewers with a standardized framework to assess whether AI use is appropriate, and helps in formulating more precise academic ethics guidelines and related supporting

[2] see Mohammad Hosseini, et al., "CRediT Roles and Example Research Tasks That Could be Attributed to Them," https://zenodo.org/records/18421449.

[3] Elsevier, "CRediT Author Statement," https://www.elsevier.com/researcher/author/policies-and-guidelines/credit-author-statement.

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documentation (e.g., "AIxCRediT Internal Management Guidelines for Editors," "AIxCRediT Review Guidelines for AI Use in Journals," etc.).

4. Data collection: Facilitates the collection of data on actual AI usage across different research stages within the scholarly community, thereby supporting follow-up research or informing future policy development.

For practical implementation, the *JoEMLS* has also refined certain practices to make the New Regulation more effective. In executing the AIxCRediT model, we have adopted a "form-based declaration document" format, which offers the following four benefits:

1. Integrates AI usage disclosure with the research workflow: The New Regulation maps AI usage scenarios to specific research activities (such as study design, literature review, statistical analysis, and writing). This approach more clearly presents the points at which AI intervenes in the research process, enhancing transparency of the workflow.
2. Defines research activities with AI participation levels and CRediT concepts: By grading AI usage, it distinguishes different levels of AI involvement in research and emphasizes clarifying research responsibilities and benefits. It avoids simply noting "AI used or not" or providing only a descriptive paragraph, making AI usage more concrete and comparable, and helps establish a more structured disclosure method.
3. Enhances traceability of AI usage information: By disclosing the research activities, usage levels, and tool information related to AI use, one can more clearly track AI's role in the research process, which helps strengthen academic accountability and transparency. A summary paragraph outlines the usage scenario, and DOI hyperlinks guide readers to download related files from the official website and review the form.
4. Practical feasibility: The form is highly structured, so in the future both submission system providers and other journals can directly adopt or adapt this framework. If integration with publishing standards such as JATS (Journal Article Tag Suite) is needed, they only need to add the relevant fields into the existing structure to enable structured tagging, providing good system extensibility.

In summary, the extent to which an author engages in interactive dialogue with generative AI tools is closely related to academic ethics. In the research and writing process, if an author repeatedly and uncritically relies on suggestions or answers obtained from AI without verifying their credibility and accuracy, the integrity of the work can be compromised. Such a design has a dual significance:

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it represents active participation and contribution in human–machine interaction; at the same time, it serves to remind and urge authors to engage in further reflection during the research publication process, thereby improving the quality of the final scholarly output.

Generative AI tools are evolving extremely rapidly, and people's acceptance is likewise accelerating, making the requirements for disclosure and transparency systems proposed by journals all the more urgent. In facing shifts in usage habits and application environments, might the regulations and requirements again evolve from complex to simpler? Confronted with such a complex and changing situation, although our journal has highlighted this highly significant academic ethics issue, we must all proceed with vigilance and caution.

How can accusations of plagiarism regarding AI-generated content be transformed into recognition of the author's creative expression? The answer lies in recognizing that whether AI usage constitutes plagiarism depends on the author's full interactive engagement with the AI and the creative effort invested, and all of this must conform to academic ethical norms. At the same time, this helps journal editors and authors deeply recognize that the originality of articles originates entirely from human authors, with AI serving solely as a supplementary tool. From the perspective of the journal's editor-in-chief, I am highly committed to supporting authors in critically evaluating the suitability of co-authorship, reinforcing accountability mechanisms, ensuring the ethical and appropriate use of AI tools, and exploring the evolving experiences of academic research and writing in this new era by implementing this approach of self-disclosure and transparency. This humanistic concern far outweighs purely technical measures; it should serve as an aspect of sound ethics education and is necessary for lifelong learning.

The *JoEMLS* was founded in March 1970, and this March we held a symposium to celebrate the 55th anniversary, which inspired us to continue forging ahead into a fresh start of AI academic ethics. In this issue (Volume 63, Issue 1), a total of 10 articles were processed, with four accepted and six rejected, resulting in a rejection rate of 60%. The four accepted articles are: "Predictive Power of Artificial Intelligence Dependence and Digital Competence on Filipino Academic Librarians' Research Capability" by Jolo Van Clyde S. Abatayo; "Exploration of Senior Services in Taiwan's Public Libraries in an Aged Society: A Case Study and Practical Analysis" by Shan-Ju Lin Chang; "Exploring Research Trends in Chinese Indonesians: A Bibliometric Study Utilizing the Scopus Database" by Anju Nofarof Hasudungan and Linda Sunarti; and "Exploring

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Related Researchers in Institutional Repositories Based on Machine Learning: A Case Study of Fu Jen Catholic University" by Meng-Hsuan Tsai, Shun-Der Chen, and Hai-Lun Tu. We extend our sincere gratitude to all authors and scholars who partake in the submission and review processes. As *JoEMLS* enters its 56th year, we thank the authors of these four major contributions for their participation and contributions, and for joining our journal in witnessing this era of AI prominence.

Jeong-Yeou Chiu
JoEMLS Chief Editor

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編者言

學術期刊揭示貢獻者角色及AI工具運用之透明度規範的創新應用

繼2025年底第一版生成式AI之自我揭露與誠信原則（*Guidelines on Self-Disclosure and Integrity in the Use of Generative AI*）公告之後，由於排列等候隔年（今年2026年）出版的在途稿件數量眾多，因此在編輯業務上，教育資料與圖書館學（*Journal of Educational Media & Library Sciences*，簡稱*JoEMLS*）輔以徵詢自願者方式，主動邀請作者參與本刊所公告的AI聲明建議事項，以便彌補投稿與前述第一版「誠信原則」公告的時間差。然而，自今年下半年開始，本刊63卷2期（2026年7月）起，亦將邀請目前已接受但待刊登稿件之作者，依照新版（第二版）「生成式AI使用之自我揭露與透明規範」（以下簡稱「新制」）來試行屬於各個單獨作者更詳細的揭露事項；但對於新投稿之作者，則將明確要求其遵從新規範，俾使明年64卷1期（2027年）起，全面開展實施新制。

這項新制結合國際既有的「貢獻者角色分類法」（Contributor Role Taxonomy，簡稱CRediT），加上AI使用於學術寫作自我揭露的本刊新創分類（即AI Disclosure/Assistance Taxonomy，簡稱AIDAT）與「AI與作者參與程度分級」等三項功能，創建合一框架，要求作者不僅揭露他們身為人類實質研究者的貢獻，並且揭露在每個貢獻環節中，作者群使用AI工具之具體輔助類型和程度。此次新制在第一版的基礎之上，除了仍然維持APA與Chicago（Turabian）之AI引文格式規範外，增加採用三種不同面向之設計模式，本刊稱之為AIxCRediT模式，包括：

貢獻者角色分類（CRediT 面向）：揭露每位作者於研究和寫作發表過程中的具體人類貢獻（14個角色）。

AI揭露輔助分類（AIDAT面向）：揭露每位作者於研究與寫作發表過程中應用AI工具之情況（九個類項）。[1]

AI與作者參與程度：揭露作者於AIDAT項下，使用AI工具而完成各項目標時，作者本人參與互動關係之深淺程度；反之，亦可視為AI對於作者本人所提供的輔助程度（五個層級）。故此可被視為一種人機互動涉入程度之揭露。

[1] AI揭露輔助分類（AI Disclosure/Assistance Taxonomy）本刊規劃為九項：A1概念發想與研究設計；A2文獻檢索、數據管理與分析；A3文獻綜述與整合（含文獻翻譯與摘錄）；A4統計分析與圖表視覺化（含各類軟體程式寫作）；A5文本初稿生成與結構化；A6文本可讀性、潤飾校對與改寫（含譯文）；A7引用文獻管理；A8評閱溝通與倫理合規性檢查（含AI成分檢測系統、查重系統、審查意見回應）；A9論文宣講與多媒體生成演示。

目前國際間學術期刊通用的CRediT制度共列出14項功能。[2] 它為作者群提供了所撰該著作之不同貢獻類型的選項描述，同時解決共同作者署名的確切責任歸屬，從而提升學術發表之學術倫理透明度。在Elsevier的實務觀點裡，也不難發現CRediT制度可協助學界進一步闡明：(1)通訊作者（corresponding author）負責確保文字撰述（descriptions）準確無誤，並得到所有作者的同意；(2)應負責任地表達CRediT所對應的作者分工角色；(3)作者可同時於多個角色中做出貢獻；(4) CRediT並無企圖改變或干預作者群彼此間的資格認定標準。[3] 目前CRediT制度的實際做法通常都要求作者必須於期刊稿件提交過程中，明確作出宣告並附列於文末。可惜的是，CRediT的優勢仍有其局限性，特別是今日AI應用環境下，兩者於學術研究發表之間的對應關係；以及其並未就14項分工執掌與共同作者排名順序關係做任何倫理約束，而採信同一著作裡的作者群自行所做之決定。換言之，自律與自重依然是不得不為的主軸信念。

綜觀這些現象，本刊所思考的AIxCRediT新制芻議便應運而生。AIxCRediT模式屬於「雙面向三維度」之結構，旨在應對學術寫作中AI工具日益普及，連帶而起的誠信透明度挑戰，以及督促與提醒作者更大的學術倫理自覺與內省。AIxCRediT之設計強化了學術責任歸屬之明確性，並非盲目地限制那些已具備合理、審慎且負責任之AI工具使用情況。整體而言，AIxCRediT芻議有如下特色：

1. 細緻透明：提供比單純「使用AI」更細緻的揭露，讓共同作者意識到自己之職責與分工，而讀者清楚知道AI介入的具體環節；
2. 責任落實：強化了人類作者對每個研究步驟的最終責任，即使該步驟有AI輔助；
3. 標準規範：為期刊編輯者和審稿者提供了一個標準化的框架，以評估AI的使用是否恰當，並有助於制定更精確的學術倫理規範，以及後續相關配套工作指導文件（如：「AIxCRediT期刊編輯內部管理準則」、「AIxCRediT期刊AI使用評閱準則」等）；
4. 數據收集：有助於學術界收集關於AI在不同研究階段的實際應用數據，從而發展後續研究，或指導未來政策的制定。

為了更具體的實務操作需要，本刊亦嘗試改進若干做法，以使新制設計能更具理想性。此AIxCRediT模式在執行時，特別採取「表單式聲明文件」的呈現方式，它的益處有下列四項：

1. 將AI使用揭露與研究流程結合：新制將AI使用情形對應至研究流程中的各項研究活動（如研究設計、文獻整理、統計分析與寫作等）。此作法

[2] 詳細資料見 Mohammad Hosseini, et al., “CRediT Roles and Example Research Tasks That Could be Attributed to Them,” https://zenodo.org/records/18421449.

3 Elsevier, “CRediT Author Statement,” https://www.elsevier.com/researcher/author/policies-and-guidelines/credit-author-statement.

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可更清楚呈現AI在研究過程中的介入環節，提升研究過程的透明度。

2. 採用AI參與程度分級與CRediT概念輔助，界定研究活動範圍：透過AI使用分級，區分AI在研究中的不同介入程度等級，鼓勵作者選填意願並自行評估參與互動之強度，益於檢討與精進AI使用效益；避免僅以「有無使用AI」或僅以文字段落說明，使AI使用情形能更具體且具可比較性，有助於建立較為結構化的揭露方式。
3. 提升AI使用資訊之可追溯性：透過揭露AI使用之研究活動、使用層級及工具資訊，可更清楚追蹤AI在研究過程中的角色，有助於強化學術責任與研究透明度。以文字段落概略說明使用情況，並利用文章本身所註冊之DOI超連結功能，指引讀者連回官網下載相關檔案，並檢視該表單。
4. 具備實務導入之可行性：表單結構化程度高，未來無論是投稿系統廠商或其他期刊，皆可依此架構直接導入或調整使用，或是需與「期刊文章標籤套件」（Journal Article Tag Suite，簡稱JATS）等學術出版標準整合，也僅需於既有結構中擴充相關欄位，即可進行結構化標記，具備良好的系統擴充性。

質言之，作者參與生成式AI工具互動討論的涉入程度，實與學術倫理議題有密切關聯。在研究與寫作過程中，若作者對於自己提問AI所獲致之內容未再作深度思考、多層次對話與查核，則這類的AI工具使用行為顯然有學術舞弊及疏漏之可能。因此，就AI參與程度分級進行揭露的這種設計，必然有其重要性。而且這種設計將是雙面意義：人機互動下的積極參與及付出；同時也可提醒和敦促作者再多做研究發表過程中的反思，來提升最終的學術成果品質。

生成式AI工具的發展極為迅速，人們的接受度也隨之加速提升，而期刊所提出的揭露與透明制度之要求，自然非常急切。在面對使用習性與工具多元的時空環境下，即使新設制度在未來也可能面臨極大的挑戰。我們也相信未來的五至十年內，這些制度性的學術倫理規範要求，相對地將顯得相當窘迫；或許有些要求項目仍會有絕對的必要性，但有些卻可能會變得尷尬與多餘，因為屆時已有絕大多數的AI工具操作已然成為學者必備且必要的需求技能。若此，AI透明規範要求可能又將由繁趨簡？面臨這樣複雜多變的情境，儘管本刊突顯出這項深具意義的學術倫理議題，但我們都必須戒慎恐懼、步步為營。

如何將AI生成內容的抄襲指控，轉變成作者創意表達的認可？答案應該是：唯有認定AI抄襲與否取決於人與AI的充分互動參與，以及付出努力不斷地同AI腦力激盪時，這才是真正關鍵；同時也讓期刊主編及作者都能深刻體認文章的原創性自始自終源自於人類作者，而AI終究只是輔助工具。基於期刊主編角色，便極為期待能藉由這項自我揭露與透明機制的履行，來協助作者自我檢視共同作者掛名的妥切性、問責機制（accountability）的確知、AI工具的合宜

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使用，以及從中所獲致的新時代研究寫作經驗。而這些都必須符合學術倫理常軌。這種人文關懷遠勝過於技術的手段，它應該是一種良善的科技倫理教育，也是終身學習之所需。

本刊於1970年3月創刊至今，在今年3月也舉辦55週年慶座談會，也就激勵本刊繼續勇往直前，邁向AI新的學術倫理紀元與挑戰。本卷期63卷1期總計處理10篇來稿，接受刊登其中四篇論文，本期退稿率來到60%。此四篇研究論文為：Jolo Van Clyde S. Abatayo發表的「Predictive Power of Artificial Intelligence Dependence and Digital Competence on Filipino Academic Librarians' Research Capability」；「高齡社會中臺灣公共圖書館老年服務之探討—個案研究與實務分析」為林珊如所撰；Anju Nofarof Hasudungan與Linda Sunarti之「Exploring Research Trends in Chinese Indonesians: A Bibliometric Study Utilizing the Scopus Database」；以及蔡孟軒、陳舜德、杜海倫三位所撰之「基於機器學習探索機構典藏中關聯研究者—以輔仁大學為例」。在本刊邁入第56個年頭之際，感謝這四篇大作作者們的參與及審查者的貢獻，能與本刊共同見證這個AI高光時期的年代。

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Research Article

Predictive Power of Artificial Intelligence Dependence and Digital Competence on Filipino Academic Librarians' Research Capability

Jolo Van Clyde S. Abatayo

ABSTRACT

In the evolving landscape of academic librarianship, integrating artificial intelligence (AI) and digital technologies has significantly reshaped professional practices and research engagement. This study investigates the predictive relationship between AI dependence and digital competence on the research capability of academic librarians in the Philippines. Grounded in the Unified Theory of Acceptance and Use of Technology 2, supported by Self-Efficacy Theory and the Diffusion of Innovations Theory, the study employed a descriptive-correlational and predictive quantitative research design. A structured questionnaire was administered to 1,000 librarians across Luzon, Visayas, and Mindanao, assessing levels of AI dependence, digital competence, and research capability. Results revealed a high level of AI dependence (M = 4.01) and a very high level of digital competence (M = 4.24), while research capability was only at a moderate level (M = 2.97). Pearson correlation showed significant positive relationships between the independent variables and research capability, with digital competence showing a stronger association (r = 0.328) than AI dependence (r = 0.194). Multiple regression analysis confirmed that both predictors significantly influence research capability, with digital competence emerging as the dominant predictor. Based on these results, the Artificial Intelligence and Digital Competence–Research Capability Model (AIDC–RC Model) was developed to illustrate the validated causal pathways. The model provides a strategic framework for designing interventions. It is recommended that academic institutions strengthen professional development focused on ethical AI use, digital fluency, and sustained research training to bridge the gap between technological proficiency and scholarly productivity.

Keywords: *Academic librarianship, Artificial intelligence, Artificial intelligence dependence, Digital competence, Library and information science, Research capability*

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Introduction

In the rapidly evolving digital landscape of academic libraries, librarians are increasingly expected to integrate emerging technologies, particularly artificial intelligence (AI), into their professional practices while maintaining high levels of digital competence. The adoption of AI tools, ranging from automated cataloging/metadata support to AI-assisted reference and content services, has reshaped library workflows and professional roles, requiring academic librarians to adapt to rapid technological change (Ayinde et al., 2025; Kim, 2025; Yang et al., 2024).

Despite these transformative possibilities, librarians in the Philippine context continue to face persistent challenges. Uneven access to professional development, limited digital infrastructure, and uncertainties surrounding the ethical use of AI hinder their ability to engage in research meaningfully. Although librarians often demonstrate positive attitudes toward research, many struggle with research design, statistical analysis, and digital tool integration due to insufficient institutional support (Austria & Cabonero, 2020; Sison, 2019). Overreliance on AI, especially in areas requiring ethical reasoning and professional judgment, further compounds these difficulties. Scholars caution that dependence on AI tools may erode critical thinking, ethical discernment, and cognitive autonomy when users accept AI outputs without sufficient evaluation (Cox, 2024; Lo, 2024; Rafiq, 2024; Zhai et al., 2024).

Amid these challenges, scholarship highlights the importance of digital competence and structured capacity-building. Institutional support programs and experiential learning initiatives have been shown to strengthen librarians' research confidence and technical abilities (Anderson et al., 2022). The DigComp 2.1 framework, for example, identifies essential competencies in digital communication, security, and content creation, all of which are increasingly critical to academic librarianship (Borbély, 2022; Mejías-Acosta et al., 2024). Yet, in many developing regions, librarians continue to rely heavily on self-directed learning due to the absence of formal training structures (Xwayi, 2025). Complementary initiatives that promote AI literacy and critical digital thinking have also demonstrated potential to strengthen librarians' research roles while mitigating the risks associated with automation (Cox, 2024; Tripathi, 2024).

To provide a stronger theoretical foundation, this study integrates three established frameworks: the Unified Theory of Acceptance and Use of Technology (UTAUT), Self-Efficacy Theory, and the Diffusion of Innovations Theory. UTAUT explains technology adoption in organizational settings through four core determinants: performance expectancy, effort expectancy, social influence, and facilitating conditions. These will go along together with moderating variables

such as age, gender, experience, and voluntariness of use (Venkatesh et al., 2003). In academic and digital library contexts, UTAUT has been widely applied to explain the adoption of AI and related information technologies by librarians and users (Ali & Warraich, 2024; Andrews et al., 2021; Fang et al., 2025). Applied to librarianship, it highlights how expectations about AI's usefulness and ease of use, social norms within professional networks, and available institutional support can shape librarians' levels of AI dependence and digital competence. Self-Efficacy Theory (Bandura, 1997) introduces a psychological dimension by emphasizing librarians' beliefs in their ability to perform research-related tasks effectively. Those with higher self-efficacy are more likely to undertake complex activities, such as research design, data interpretation, and publication. The Diffusion of Innovations Theory (Rogers, 2003) explains how technologies spread across adopters, from early innovators to late adopters, and underscores the influence of institutional culture, peer networks, and perceived innovation value. Taken together, these frameworks provide a comprehensive perspective on how external technological factors (UTAUT), internal psychological readiness (Self-Efficacy), and organizational or social contexts (Diffusion of Innovations) interact to shape librarians' research capability.

This research underscores both the promise and the risks of emphasizing AI literacy and digital competence in librarianship. While such competencies can enhance librarians' engagement in research and scholarly productivity, excessive reliance on automation may weaken critical thinking, ethical discernment, and professional judgment. In the Philippine context, studies remain limited, and none have examined these dynamics within a unified predictive framework. Specifically, there is a lack of research that integrates behavioral (UTAUT), psychological (Self-Efficacy), and technological diffusion (Diffusion of Innovations) perspectives to explain how AI dependence and digital competence jointly influence librarians' research capability.

By focusing on librarians from Luzon, Visayas, and Mindanao, this study seeks to provide empirical insights into how AI reliance and digital skills intersect to affect scholarly productivity. The predictive-causal model developed here offers academic institutions a strategic framework for designing professional development programs that align technological integration with research empowerment. Ultimately, this work contributes to the advancement of librarians as digitally skilled, ethically aware, and research-capable professionals in an era of accelerating technological change.

Furthermore, this study's emphasis on librarians' digital competence and responsible AI use aligns with broader educational and innovation priorities. Strengthening librarians' research capability directly supports SDG 4: Quality

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Education, as librarians play a pivotal role in advancing inclusive access to knowledge and lifelong learning within higher education. At the same time, enhancing digital skills and promoting ethical AI integration contribute to SDG 9: Industry, Innovation, and Infrastructure, by reinforcing the digital research infrastructure needed for resilient academic institutions. Rather than invoking these SDGs as abstract ideals, this study situates them within the concrete context of librarianship: cultivating research-ready, digitally fluent, and ethically grounded professionals who can sustain innovation in higher education.

Finally, this study developed and tested a predictive framework linking artificial intelligence (AI) dependence and digital competence to the self-reported research capability of academic librarians in the Philippines. Conceptually informed by the Unified Theory of Acceptance and Use of Technology (UTAUT), Self-Efficacy Theory, and the Diffusion of Innovations, the study's contributions are threefold: 1. AI dependence and digital competence were operationalized with instruments adapted to academic librarianship; 2. their associations with research capability were estimated through multiple regression while reporting model fit and assumptions; and 3. digital competence was identified as a key lever for professional development. Given the cross-sectional, non-probability design, the findings are associative rather than causal, and generalizations are limited to populations similar to the sample frame. These boundaries align the study's claims with the available evidence and guide targeted institutional action. While not a full validation of the three theoretical models, this framework represents an important step toward integrating behavioral, psychological, and technological perspectives into the study of librarians' research capability.

Research Objectives and Questions

In light of the opportunities and risks associated with AI literacy and digital competence, this study pursued the following objectives:

1. To determine the levels of artificial intelligence (AI) dependence, digital competence, and research capability among academic librarians in the Philippines.
2. To examine the relationships between AI dependence, digital competence, and research capability.
3. To assess the predictive power of AI dependence and digital competence on librarians' research capability.

From these objectives, the study was guided by the following research questions:

1. What are the levels of AI dependence, digital competence, and research capability of academic librarians?
2. Is there a significant relationship between AI dependence, digital competence, and research capability?

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3. To what extent do AI dependence and digital competence predict the research capability of academic librarians?

Related Works

This section synthesizes prior scholarship on five key areas: 1. AI adoption and risks in academic libraries, 2. technology-adoption theories applied in LIS, 3. measurement of AI dependence and cognitive offloading, 4. digital competence frameworks relevant to librarianship, and 5. librarians' research capability and scholarly roles. Taken together, these strands motivate the development of a unified predictive (associational) model for the Philippine context.

Research on technology adoption in librarianship has frequently drawn on behavioral models such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) to explain patterns of digital tool use (Ali & Warraich, 2024; Dwivedi et al., 2019; Venkatesh et al., 2003). Psychological constructs, particularly self-efficacy, have also been explored in relation to librarians' confidence in performing digital tasks and engaging in research activities (Anderson et al., 2022; Bandura, 1997). From a technological perspective, diffusion and innovation frameworks have been employed to account for how new systems and services are introduced into library practice (Rogers, 2003).

Although these studies provide valuable insights, few have sought to integrate these three perspectives into a single explanatory framework. The present study addresses this gap by combining behavioral, psychological, and technological dimensions to develop a holistic model that explains how AI dependence and digital competence jointly influence the research capability of academic librarians in the Philippines. This integrative approach distinguishes the study from earlier works while building on their theoretical and methodological foundations.

AI in Academic Libraries: Adoption, Roles, and Risks

Conceptual and empirical scholarship shows that AI is reshaping academic library functions, spanning strategy, collection management, reference services, discovery systems, and analytics, while simultaneously introducing ethical and organizational challenges. Cox (2024) examines possible trajectories for AI in academic libraries and maps their implications for staff competencies. Similarly, Manjunatha (2023) highlights how AI integration can enhance library services and indirectly strengthen librarians' research activities.

Professional bodies have also issued guidance for responsible adoption. The Association of Research Libraries (2024) has articulated Guiding Principles for Artificial Intelligence, while the International Federation of Library Associations

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and Institutions has published strategy briefs emphasizing transparency, privacy, equity, and human oversight as core values (Cox, 2023). Likewise, IFLA's Statement on Libraries and Artificial Intelligence underscores librarians' responsibility to ensure ethical, equitable, and transparent deployment of AI technologies (IFLA FAIFE [Committee on Freedom of Access to Information and Freedom of Expression], 2020).

At the same time, researchers caution that overdependence on AI may weaken critical judgment and ethical responsibility. At the same time, researchers caution that overreliance on AI systems may weaken critical judgment and ethical responsibility, as users may default to automated outputs instead of deliberate evaluation and professional discernment (Rafiq, 2024; Zhai et al., 2024). These global policy and scholarly perspectives collectively highlight a central tension: while AI offers significant opportunities for innovation in library services, its adoption must be critically balanced with librarians' enduring professional values.

Technology-Adoption Theory in LIS (UTAUT and Diffusion)

The Unified Theory of Acceptance and Use of Technology (UTAUT) provides a widely used framework for explaining librarians' adoption of emerging technologies. UTAUT posits four core determinants of technology use: performance expectancy, effort expectancy, social influence, and facilitating conditions. These will work together with key moderating variables such as age, gender, experience, and voluntariness of use (Venkatesh et al., 2003). Meta-analytic work confirms the robustness of these constructs across diverse settings (Dwivedi et al., 2019), and a recent meta-analysis focused specifically on academic and digital libraries shows that UTAUT/UTAUT2 constructs (performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, and habit) have significant, large-effect relationships with behavioral intention to use technology in library contexts (Ali & Warraich, 2024).

Within library and information science, UTAUT has been successfully applied to model librarians' intention to adopt AI and related technologies (Andrews et al., 2021; Fang et al., 2025), researchers' use of bibliographic management tools (Rempel & Mellinger, 2015), staff preparedness for mobile library services (Saravani & Haddow, 2011), and students' use of digital reference services (Al-Hatmi & Nor, 2022). These studies collectively support the suitability of UTAUT's four core constructs for understanding technology-related behaviors in academic libraries. UTAUT2, a later extension designed for consumer contexts, adds hedonic motivation, price value, and habit to the model (Venkatesh et al., 2012), but these consumer-oriented constructs are less salient where technology use is embedded in institutional work systems and direct monetary cost and

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entertainment value are not primary drivers. Accordingly, the present study draws on the original UTAUT model and focuses on its four core determinants in interpreting AI dependence and digital competence.

In this study, UTAUT is combined with Self-Efficacy Theory (Bandura, 1997) and the Diffusion of Innovations framework (Lund et al., 2020; Rogers, 2003) to provide a more comprehensive account of librarians' digital behaviors. This integrated approach captures behavioral drivers of technology use (performance and effort expectations, social norms, and facilitating conditions), the psychological dimension of confidence and self-belief, and the organizational and social processes that shape innovation adoption.

AI Dependence and Cognitive Offloading

AI dependence in this study is conceptualized using the Scale for Dependence on Artificial Intelligence (DIA/DAI), a validated unidimensional measure that demonstrates strong reliability and gender invariance (Morales-García et al., 2024).

Related research in cognitive science shows that easy access to externalized knowledge reshapes memory and information processing. Sparrow et al. (2011) identified the "Google effect," in which individuals tend to remember where information can be retrieved rather than retaining its content. Similarly, Ward et al. (2017) demonstrated that even the mere presence of smartphones can diminish cognitive capacity.

These cognitive offloading mechanisms highlight potential risks for librarians' professional practice: while AI tools may enhance efficiency, excessive reliance on them could undermine critical thinking, reflective judgment, and the exercise of professional expertise.

In line with the hypothesized framework, prior research suggests that AI dependence may influence librarians' research capability in both supportive and constraining ways. AI applications can streamline literature searching, reference management, and writing-related tasks, potentially improving efficiency and research engagement (Rafiq, 2024). At the same time, evidence suggests that over-reliance on AI dialogue systems can negatively affect critical cognitive skills (Zhai et al., 2024). However, excessive reliance on automation risks diminishing critical judgment and ethical discernment, which are essential to research integrity (Cox, 2024; Lo, 2024). Similarly, evidence points to digital competence as a strong enabler of research capability. Frameworks such as DigComp 2.1 emphasize digital communication, security, and content creation as foundations for scholarly productivity (Borbély, 2022; Mejías-Acosta et al., 2024). Empirical studies confirm that librarians with stronger digital skills demonstrate greater confidence and participation in research activities (Anderson et al., 2022; Sison,

2019). These findings provide empirical support for the hypothesized links in the AIDC-RC model, where both AI dependence and digital competence are expected to predict librarians' research capability.

Digital Competence Frameworks for Librarianship

The European Commission's DigComp 2.1 framework outlines key competence areas for digital proficiency (Carretero et al., 2017). It has been widely applied across education and librarianship to benchmark and guide professional skills development (Borbély, 2022).

Empirical studies affirm the value of digital competence for librarians' scholarly and professional roles. Wolski et al. (2020) and Joel and Ibrahim (2021) demonstrated that digital competence supports research data management, collaboration, and knowledge dissemination. Evidence from the Philippines echoes these findings: Yazon et al. (2019) reported significant positive associations between librarians' digital competence and their research productivity, although Friday et al. (2024) observed a positive but statistically non-significant effect.

Taken together, these studies suggest that digital competence is an enabling factor for research capability, though its impact may vary across contexts and methodological approaches.

Librarians' Research Capability and Scholarly Roles

Surveys consistently show that librarians express enthusiasm for research, yet face persistent skills and support gaps. In the Philippine context, Austria and Cabonero (2020) found that librarians are generally proficient in literature review but struggle with methodology and data analysis, a pattern echoed by Sison (2019) and Eclevia and Cordova (2022). International perspectives mirror these challenges, with studies reporting similar gaps in research competencies (Anderson et al., 2022).

Recent scholarship points to both opportunities and limitations in strengthening librarians' scholarly roles. Bolasco (2023) confirmed that digital competencies facilitate technology use in educational settings, while Dube et al. (2024) and Xwayi (2025) emphasized that digital literacy underpins librarians' ability to both support and conduct research. However, Lo (2024) and Edam-Agbor et al. (2025) caution that without ethical AI literacy, librarians' research contributions remain constrained.

Together, these findings highlight a dual challenge: librarians increasingly recognize the importance of digital and AI competencies for research, yet structural and ethical barriers continue to limit their full participation as scholarly contributors.

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Synthesis and Gap

Existing research establishes several important foundations: 1. the rapid integration of AI accompanied by explicit ethical guardrails, 2. theoretically grounded models of technology adoption, 3. validated measures of AI dependence and well-documented cognitive offloading mechanisms, 4. mature digital-competence frameworks, and 5. evidence of librarians' uneven yet vital engagement in research.

What remains underexplored, particularly in the Philippine academic-library context, is a unified predictive model that connects AI dependence and digital competence to self-reported research capability. Such a model must integrate behavioral, psychological, and technological dimensions within a single framework. This study seeks to fill that gap.

Methodology

This section outlines the research design, participants, instrumentation, and statistical procedures employed to investigate the predictive relationship between artificial intelligence (AI) dependence, digital competence, and research capability among Filipino academic librarians.

Research Design

The study employed a quantitative, non-experimental, correlational–predictive design to examine the relationships among AI dependence, digital competence, and librarians' research capability. This design is well-suited to the study's objectives, as it enables the identification of patterns and predictive relationships within naturally occurring data without manipulating variables. As Creswell (2014) emphasized, quantitative research is particularly valuable for analyzing trends, establishing associations, and testing theoretical frameworks in large-scale data settings. In the present study, such a design allowed the quantification of librarians' AI dependence, digital competence, and research capability, while also testing a predictive framework grounded in established theories. The approach goes beyond descriptive work by modeling associations and predictive relationships, thereby providing a structured foundation for evidence-based strategies and institutional policies that support AI literacy, digital fluency, and scholarly productivity among academic librarians. At the same time, because the design is cross-sectional and non-experimental, regression coefficients are interpreted as associations rather than causal effects, and causal language is deliberately avoided.

The study was conceptually guided by three theoretical perspectives: the Unified Theory of Acceptance and Use of Technology (UTAUT), Self-Efficacy Theory, and the Diffusion of Innovations Theory. These frameworks informed

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the selection of constructs and the interpretation of results, particularly in linking technology use, confidence in research processes, and adoption behaviors. In line with the academic-library context of this research, we draw specifically on UTAUT's four core determinants: performance expectancy, effort expectancy, social influence, and facilitating conditions. It was rather used than the consumer-oriented extensions introduced in UTAUT2 (Venkatesh et al., 2003, 2012).

In practice, these theoretical perspectives provided conceptual guidance for selecting and adapting validated instruments rather than functioning as direct sources of questionnaire items. AI Dependence was measured using the Morales-García et al. (2024) scale, which we interpret as aligning with the effort and performance expectancy dimensions described in UTAUT. Digital Competence was structured using Mejías-Acosta et al. (2024), aligning with innovation-adoption processes and facilitating conditions from both the Diffusion of Innovations framework and UTAUT. Research Capability was adapted from Sison (2019), reflecting Self-Efficacy Theory through measures of confidence and engagement in research processes. In this way, the theories informed the predictive framework by shaping construct selection and interpretation of findings, while ensuring the use of previously validated, context-appropriate measurement tools.

This design further enhances internal validity through its structured approach to measurement and statistical analysis and ensures external relevance by incorporating a geographically diverse sample from Luzon, Visayas, and Mindanao. While the non-experimental nature limits causal inference, predictive modeling provides a robust foundation for developing evidence-based strategies and institutional policies that support AI literacy, digital fluency, and scholarly productivity among academic librarians. Because the design is cross-sectional and non-experimental, regression coefficients are interpreted as associations rather than causal effects. Therefore, causal language was deliberately avoided, and the model is framed as predictive and explanatory within the observed data structure.

Population and Sampling Procedure

The target population of this study comprised academic librarians from higher education institutions across the three major island groups in the Philippines: Luzon, Visayas, and Mindanao. To ensure proportional geographic representation, the study employed a quota sampling technique with regional stratification. Fixed quotas were established per region: 400 librarians from Luzon, 300 from Visayas, and 300 from Mindanao, for a total of 1,000 respondents. Within each regional quota, participants were selected using

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non-probability convenience sampling based on accessibility, availability, and institutional cooperation. Quota sampling, which involves dividing the population into mutually exclusive subgroups and then selecting participants non-randomly within each subgroup to meet predetermined quotas (Battaglia, 2008), enhances representativeness by ensuring that specific characteristics of the population, in this case, regional location, are proportionally reflected in the sample. Although it does not allow for statistical generalization in the same way probability methods do, quota sampling is widely recognized as an appropriate approach in contexts where randomization is not feasible (Daniel, 2012; Etikan et al., 2016). Furthermore, the total sample size of 1,000 exceeds the recommended minimum for multiple regression analysis, ensuring adequate statistical power to detect predictive relationships (Hair et al., 2014).

A total of 1,000 valid responses were obtained, meeting the predetermined regional quotas (Luzon = 400, Visayas = 300, Mindanao = 300) and yielding a 100% response rate. Inclusion criteria were: 1. currently employed academic librarians in higher education institutions (HEIs) and 2. at least one year of professional tenure. Exclusion criteria were: 1. non-librarian staff and 2. incomplete survey responses. While quota–convenience sampling ensured proportional geographic representation, the absence of random selection restricts statistical generalizability. For this reason, the findings are best interpreted as analytically generalizable to comparable contexts rather than universally applicable.

It is also important to note that while this study ensured geographic representation from Luzon, Visayas, and Mindanao, it did not explicitly control for institutional-level variations such as funding support, organizational culture, or digital infrastructure. These contextual differences may influence how academic librarians experience and develop digital competence, AI dependence, and research capability. Future research may incorporate stratification by institutional characteristics to capture these nuanced influences.

Another limitation is that the study did not collect detailed demographic information such as age, academic qualifications, or years of professional experience. Such factors could shape librarians' digital competence, AI use, and research capability in meaningful ways. Future research could incorporate these variables to identify subgroup differences and tailor professional development programs more effectively.

Research Instrument

Data were collected using a researcher-modified structured questionnaire divided into three major sections: Artificial Intelligence Dependence, Digital Competence, and Research Capability. Each section of the instrument was

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adapted from previously validated tools and revised to fit the research context of academic librarianship in the Philippines. The Artificial Intelligence Dependence section was based on the Dependence on Artificial Intelligence (DIA) Scale developed by Morales-García et al. (2024) and was adapted to reflect professional AI usage in academic settings. The Digital Competence section was derived from the framework of Mejías-Acosta et al. (2024) and was organized into six subdimensions: Access to Digital Content Management, Digital Empathy, Use of Digital Media, Digital Security, Communication of Digital Content, and Creation of Digital Content. The Research Capability section was developed by integrating and adapting indicators from Sison (2019), structured into two subdimensions: Research Process Skills and Research Involvement. Research Process Skills (Items 1-10) refer to librarians' technical ability to perform the core stages of the research process, such as identifying a topic, reviewing literature, formulating questions, designing methods, collecting and analyzing data, and disseminating findings. Research Involvement (Items 11-17) refers to the extent of librarians' participation in research activities, including seminars, forums, conferences, and publications. For transparency, the complete set of items is presented in Appendix, organized according to these subdimensions. All items were rated on a five-point Likert scale, with anchors tailored to each dimension.

Prior to full implementation, the instrument underwent expert review and pilot testing to establish validity and reliability. Three experts in educational research and library and information science evaluated the draft instrument for content validity, clarity, and cultural appropriateness. Their feedback prompted revisions to ambiguous wording, such as simplifying technical terms in the Digital Competence scale and clarifying phrasing in the Research Capability items. The revised questionnaire was then pilot tested with 30 academic librarians who were not included in the main study sample. Pilot data were analyzed to assess reliability and construct validity. Results confirmed high internal consistency (Cronbach's α = .926 overall; AI Dependence = .891; Digital Competence = .933; Research Capability = .904). Exploratory factor analysis further supported dimensionality (KMO = .902, Bartlett's χ^2 = 1254.37, p < .001), with items retained if factor loadings were ≥ .40 and cross-loadings < .30. No items were removed, but minor adjustments were made to improve clarity based on pilot feedback. These procedures ensured that the final instrument was psychometrically sound and appropriate for full-scale deployment.

Data Collection Procedure

Following instrument validation, data were collected using a combination of online and paper-based survey dissemination to ensure accessibility across the three major island groups of the Philippines: Luzon, Visayas, and Mindanao. This

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dual-mode strategy was designed to address disparities in internet connectivity and institutional infrastructure, particularly in remote or underserved regions. Prior to participation, respondents were provided with an informed consent statement that outlined the objectives of the study, the voluntary nature of participation, and assurances of confidentiality. Surveys were distributed through institutional channels, professional library associations, and researcher networks to maximize outreach and participation.

The data collection phase lasted six weeks, during which follow-up reminders were issued to help achieve the predetermined regional quotas. All completed surveys were carefully screened for accuracy and completeness before inclusion in the final dataset. To uphold ethical compliance, no personally identifiable information was collected, responses were anonymized, and participation was entirely voluntary and uncompensated.

Statistical Treatment of Data

The statistical analysis of the data collected in this study was conducted using the Statistical Package for the Social Sciences (SPSS), a widely accepted software for quantitative research. The analysis followed a three-phase process aligned with the research objectives: descriptive analysis, correlation analysis, and predictive modeling.

In the first phase, descriptive statistics were computed to determine the levels of artificial intelligence (AI) dependence, digital competence, and research capability among academic librarians. Measures of central tendency, specifically mean scores, were calculated for each variable and its subdimensions. These values were interpreted using a predefined Likert scale rubric that categorized responses as Very Low, Low, Moderate, High, or Very High, thereby ensuring consistent and meaningful interpretation.

In the second phase, Pearson's product-moment correlation coefficient (r) was employed to assess the strength and significance of the linear relationships between the independent variables (AI dependence and digital competence) and the dependent variable (research capability). This method was selected for its suitability in analyzing continuous variables and its capacity to detect both positive and negative associations. Statistical significance was determined using a p-value threshold of .05.

In the third phase, multiple linear regression analysis was carried out to evaluate the predictive power of AI dependence and digital competence on librarians' research capability. This procedure generated standardized beta coefficients (β) to indicate the relative contribution of each predictor to the outcome variable, alongside unstandardized coefficients (B), standard errors, and t-values to provide a comprehensive account of the model's explanatory capacity.

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The regression results were synthesized into the proposed AIDC–RC Model, which conceptually visualizes the validated predictive relationships.

This multi-layered statistical approach ensured analytical rigor, supported hypothesis testing, and maintained alignment with the study's theoretical framework and objectives.

Results and Discussion

This section presents the analyzed data and interprets the findings in relation to the study's objectives and theoretical framework. Key trends, correlations, and predictive insights are discussed to explain the interplay among the examined variables.

As shown in Table 1, the findings reveal that librarians in the Philippines exhibit a high level of artificial intelligence (AI) dependence, with an overall mean of 4.01, verbally interpreted as Agree and descriptively categorized as High. All five indicators registered mean scores ranging from 4.0 to 4.1, indicating strong agreement among respondents regarding their reliance on AI for various professional tasks. These results suggest that AI tools have become integral to librarians' workflows, particularly in routine functions such as data processing, content generation, and digital service facilitation.

This outcome aligns with recent literature describing increased AI uptake in academic library services, particularly for automating routine tasks and improving service efficiency (Ayinde et al., 2025; Kim, 2025). Similarly, Edam-Agbor et al. (2025) confirmed high levels of AI awareness and acceptance among librarians, though they cautioned that actual application varied according to demographic factors and institutional readiness.

Table 1 Level of AI Dependence among Librarians

Item	Mean	Verbal Description	Verbal Interpretation
1. I feel unprotected when I don't have access to artificial intelligence.	4.1	Agree	High
2. I worry about delaying my tasks or projects if I don't use artificial intelligence.	4.0	Agree	High
3. I do my best to stay current in artificial intelligence to remain relevant.	4.0	Agree	High
4. I constantly need validation or feedback from artificial intelligence systems to feel confident in my decisions.	4.01	Agree	High
5. I don't fear that artificial intelligence will replace my current skills or capabilities.	4.02	Agree	High
Overall	4.01	Agree	High

Note: Legend: Very High = 4.20 – 5.00; High = 3.40 – 4.19; Moderate = 2.60 – 3.39; Low = 1.80 – 2.59; Very Low = 1.00 – 1.79.

The data further resonate with Morales-García et al. (2024), who conceptualized AI dependence as a compulsive reliance on automated systems

for decision-making. Respondents' agreement with items such as the need for validation from AI and fears of skill obsolescence underscores a psychological attachment to AI tools, signaling a shift from simple adoption to dependence. This finding is supported by qualitative evidence that subject librarians' use of AI-generated content is shaped by perceived performance benefits and practical work demands, alongside concerns about accuracy, ethics, and professional responsibility (Yang et al., 2024).

However, this dependence carries potential drawbacks. Research indicates that over-reliance on AI dialogue systems can reduce critical thinking and analytical judgment when users accept AI-generated recommendations without adequate scrutiny (Rafiq, 2024; Zhai et al., 2024). Cox (2024) likewise emphasizes that while AI can enhance efficiency, it lacks the nuanced understanding and empathetic capacity inherent to librarianship. Thus, while the high mean scores indicate widespread AI integration, they also highlight the importance of cultivating a critical and ethically grounded stance toward AI use.

The findings further point to the need for institutional policies that define responsible AI use. Without clear guidelines, librarians may apply AI inconsistently, risking compromises in data integrity or academic rigor. Overreliance also raises concerns about cognitive offloading, where essential professional skills such as critical analysis or manual cataloging may deteriorate due to automation. To mitigate these risks, institutions must promote a balanced approach, one that safeguards librarians as active knowledge practitioners rather than passive consumers of AI. Embedding AI ethics and critical thinking modules in continuing professional development programs is particularly vital to sustain professional standards in the face of accelerating automation.

The results also affirm the explanatory relevance of the Unified Theory of Acceptance and Use of Technology (UTAUT), which highlights performance expectancy, effort expectancy, social influence, and facilitating conditions as key determinants of technology use (Venkatesh et al., 2003). Librarians' perceptions of AI's utility and the normative pressure to adopt it appear to reinforce their dependence, while the Diffusion of Innovations Theory (Rogers, 2003) helps contextualize how innovations like AI become normalized within professional practice.

Overall, the high level of AI dependence reflects not only the success of technological integration but also the need for balanced engagement strategies and institutional frameworks that safeguard professional autonomy, critical reasoning, and ethical decision-making in academic librarianship.

Table 2 presents the overall mean score for digital competence among librarians, which stands at 4.24. This corresponds to a Strongly Agree rating and

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is descriptively interpreted as Very High. Among the six subdimensions, "Creation of Digital Content" registered the highest mean (4.26), followed closely by "Access to Digital Content Management" (4.25), and with the remaining dimensions clustered between 4.23 and 4.24. These results reflect a consistently high level of proficiency across digital domains, underscoring librarians' adaptability to the digitized landscape of academic libraries and their readiness to integrate digital tools into professional practice.

Table 2 Level of Digital Competence among Librarians

Item	Mean	Verbal Description	Verbal Interpretation
1. Access to Digital Media	4.25	Strongly Agree	Very High
2. Digital Empathy	4.24	Strongly Agree	Very High
3. Use of Digital Media	4.23	Strongly Agree	Very High
4. Digital Security	4.24	Strongly Agree	Very High
5. Communication of Digital Content	4.24	Strongly Agree	Very High
6. Creation of Digital Content	4.26	Strongly Agree	Very High
Overall	4.24	Strongly Agree	Very High

Note: Legend: Very High = 4.20 – 5.00; High = 3.40 – 4.19; Moderate = 2.60 – 3.39; Low = 1.80 – 2.59; Very Low = 1.00 – 1.79.

These findings support the results of Borbély (2022), who affirmed that librarians with higher educational attainment demonstrate advanced digital skills necessary for research facilitation and content management. Similarly, Atchrimi and Ogunbodede (2024) reported that South-South Nigerian librarians performed effectively in digital environments, often acquiring skills through informal means such as peer collaboration and self-study, an experience that parallels the pathways followed by many Filipino librarians.

The elevated mean scores also resonate with the DigComp 2.1 Framework emphasized by Mejías-Acosta et al. (2024), which outlines key digital competence areas, including communication, safety, and content creation. The presence of these skills among the respondents suggests that librarians are achieving a breadth of digital proficiency despite infrastructural barriers and unequal training opportunities noted by Hamad et al. (2020) and Osinulu (2021). This adaptability highlights librarians' resilience in bridging gaps through self-directed learning and professional collaboration.

The theoretical framing further strengthens this interpretation. In line with UTAUT (Venkatesh et al., 2003), the high digital competence levels may be driven by performance expectancy and effort expectancy, indicating that librarians view digital proficiency as both beneficial and manageable. Likewise, Self-Efficacy Theory (Bandura, 1997) explains how strong confidence in digital abilities enhances engagement and productivity in digitally mediated tasks. Together,

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these perspectives underscore the motivational and psychological factors that sustain high levels of digital competence.

In summary, the very high digital competence of librarians represents a critical asset for advancing digital transformation and supporting research productivity in academic libraries. However, the findings also reveal a missed opportunity to formally recognize these competencies. Although most librarians acquire their skills through informal channels, the absence of structured credentials may restrict their capacity to lead institutional digital initiatives or to engage in cross-departmental collaborations. To address this, academic institutions and library associations should consider establishing certification or microcredential programs to validate librarians' expertise. Moreover, librarians with advanced digital proficiency can be strategically positioned as institutional leaders in digital innovation, ensuring that their skills not only enhance library services but also contribute to broader organizational transformation. transformation, guiding faculty and students in navigating complex digital environments.

Table 3 indicates that the overall mean score for research capability is 2.97, verbally interpreted as Neutral and descriptively categorized as Moderate. This moderate rating is consistent across both subdimensions, Research Process Skills and Research Involvement, reflecting a balanced yet cautious level of confidence and participation in research-related activities. The results suggest that, despite strong digital competence, librarians' engagement in research remains modest, highlighting a persistent gap between digital readiness and actual scholarly productivity.

The result corroborates the findings of Sison (2019), who noted that while librarians in the Philippines generally display a positive research attitude, many struggle with the technical aspects of research, particularly instrument design and statistical analysis. Similarly, Austria and Cabonero (2020) reported that librarians tend to demonstrate proficiency in reviewing literature but often lack competence in methodology and data analysis. These earlier studies align with the present findings, reinforcing the conclusion that research capability among Filipino librarians remains moderate despite their strong information-handling skills.

Table 3 Level of Research Capability among Librarians

Item	Mean	Verbal Description	Verbal Interpretation
Research Process Skills	2.97	Neutral	Moderate
Research Involvement	2.97	Neutral	Moderate
Overall	2.97	Neutral	Moderate

Note: Legend: Very High = 4.20 – 5.00; High = 3.40 – 4.19;
Moderate = 2.60 – 3.39; Low = 1.80 – 2.59;
Very Low = 1.00 – 1.79.

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This moderate capability can also be explained through Self-Efficacy Theory, which posits that individuals with limited prior success or inadequate institutional support are likely to develop lower self-efficacy, thereby reducing their willingness to engage in more demanding research activities. Eclevia and Cordova (2021) support this interpretation, identifying gaps in self-confidence among Filipino librarians when faced with complex research tasks. Such psychological barriers compound the technical challenges, creating obstacles to deeper research engagement.

The findings underscore the need for institutional investment in mentorship programs, targeted training, and expanded opportunities for publication and conference participation to strengthen librarians' research identities and scholarly presence. At the same time, the moderate level of research capability suggests that librarians remain an underutilized scholarly workforce within higher education. Many already possess transferable expertise in evidence synthesis, digital data management, and methodological support, yet institutional cultures and role definitions often preclude them from research-oriented projects.

Future strategies should prioritize collaborative research roles for librarians, supported by structured mentorship and inclusion in research funding mechanisms. It may also be valuable to disaggregate research capability by demographic variables such as age, employment rank, or regional affiliation, as certain groups may face unique barriers that aggregate statistics obscure. Such nuanced analysis will ensure that the high levels of digital competence observed among librarians are effectively translated into sustained research involvement and meaningful scholarly productivity.

Table 4 shows that both AI Dependence (r = 0.194, p <.001) and Digital Competence (r = 0.328, p < .001) have significant positive correlations with research capability. Although both predictors demonstrate statistical significance, digital competence exhibits the stronger association, indicating that proficiency in digital skills contributes more substantially to research capability than reliance on AI tools.

These results align with the findings of Dube et al. (2024) and Borbély (2022), who emphasized the pivotal role of digital competence in enhancing librarians' capacity to support and conduct research. By contrast, the more modest relationship between AI dependence and research capability may indicate that while AI tools can support task completion, greater dependence can reduce critical engagement and reflective judgment (Zhai et al., 2024).

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Table 4 Correlation Analysis between Independent Variables and Research Capability

Variables	*r*	*p*-value	Interpretation
AI Dependence & Research Capability	0.194	.000	Significant
Digital Competence & Research Capability	0.328	.000	Significant

Note: Legend: *r* = correlation coefficient; $p < .05$ = Significant.

The broader literature further contextualizes these findings. Manjunatha (2023) reported that AI applications improve library services such as information retrieval and data management, which can indirectly support research activities. Meanwhile, Yazon et al. (2019) demonstrated a significant positive correlation between digital competence and research productivity among educators, underscoring the transferability of digital skills to scholarly outcomes. Conversely, Friday et al. (2024) found that while digital literacy influenced librarians' research productivity in South-South Nigerian universities, the relationship was not statistically significant, suggesting that other institutional or contextual factors may moderate this effect.

The observed correlation is also interpreted within the framework of Diffusion of Innovations Theory (Rogers, 2003). Early adopters of AI and digital tools are better positioned to integrate them into scholarly practice, thereby gaining a comparative advantage in research capability. However, the findings also call for a critical stance: technology should supplement rather than overshadow core competencies in research design, methodology, and analysis.

Furthermore, these correlation patterns suggest that improvements in AI use or digital competence must be accompanied by supportive organizational interventions. The moderately strong relationship, particularly for digital competence, indicates that while the requisite skills are present, librarians may still lack the motivation, time, or institutional resources needed to translate them into tangible research outputs. Integrated professional development programs that combine digital fluency, research methodology, and AI literacy within a unified curriculum may prove more effective than isolated training initiatives. At the same time, correlation strength can serve as a diagnostic indicator, signaling the need to examine structural or motivational constraints that inhibit full participation in research despite high competence levels.

Table 5 shows that both AI Dependence ($\beta = 0.194$, $p < .001$) and Digital Competence ($\beta = 0.328$, $p < .001$) significantly predict research capability. Among the two predictors, digital competence emerges as the stronger determinant, as evidenced by its higher beta coefficient and t-score, underscoring its greater influence on the dependent variable. These results highlight the centrality of digital competence in shaping scholarly productivity. Wolski et al. (2020) and

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Joel and Ibrahim (2021) similarly emphasized that librarians' digital capabilities directly enhance their ability to manage research data, collaborate in digital environments, and support research dissemination. By contrast, while AI dependence is significant, its effect must be carefully balanced with human expertise, as overreliance on automation may dilute critical engagement (Rafiq, 2024; Zhai et al., 2024).

Table 5 Multiple Regression Analysis on Predictors of Research Capability

Predictor	B	SE B	β (Beta)	t	p-value
Constant	0.117	0.164	—	0.713	.476
AI Dependence	0.157	0.020	0.194	7.850	.000
Digital Competence	0.319	0.026	0.328	12.269	.000

Note: Legend: B = Unstandardized Coefficient, SE B = Standard Error, β = Standardized Coefficient, $p < .05$ = Significant.

These regression findings also carry important implications for institutional policy and decision-making. Given the stronger predictive power of digital competence, universities should prioritize digital skill-building when allocating professional development resources. Budget planning should strategically emphasize initiatives that enhance digital content creation, data literacy, and secure information handling. Although AI dependence contributes meaningfully, its relatively lower beta value indicates that reliance on automation alone is insufficient for driving scholarly productivity. To optimize research capability, professional development must therefore cultivate both foundational digital skills and critical, reflective AI use grounded in ethical and disciplinary standards.

The results further align with prior scholarship. Bolasco (2023) demonstrated that digital competencies significantly influence the adoption of emerging educational technologies, thereby enhancing research activity. Likewise, Friday et al. (2024) reported a positive, though not statistically significant, influence of digital literacy on librarians' research productivity, suggesting that contextual or institutional factors may moderate this effect. Complementing these perspectives, Manjunatha (2023) highlighted the role of AI in improving library services, where integration into information retrieval and data management indirectly supports librarians' research activities.

Taken together, these findings are well explained by the integration of UTAUT, Self-Efficacy Theory, and Diffusion of Innovations Theory. Digital competence aligns with constructs such as performance expectancy and self-efficacy, reflecting the extent to which librarians feel capable of achieving valued outcomes through digital skills. Meanwhile, AI dependence resonates with technology adoption and usage behaviors, situated within broader innovation ecosystems. This theoretical grounding underscores that while digital

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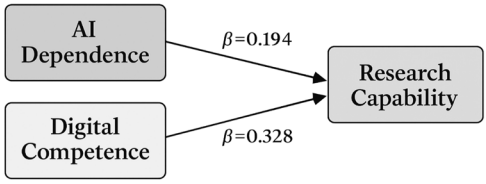
competence remains the stronger predictor of research capability, both variables interact within individual, organizational, and technological contexts to shape scholarly engagement.

Proposed Predictive Framework of Librarians' Research Capability

The Artificial Intelligence and Digital Competence–Research Capability (AIDC–RC) framework, presented in Figure 1, integrates the regression findings into a conceptual model for understanding and strengthening librarians' scholarly engagement. The framework highlights that while both AI Dependence and Digital Competence contribute to research capability, Digital Competence exerts the stronger influence. This suggests that professional development strategies should prioritize enhancing digital skills, such as secure information handling, digital content creation, and data literacy, while also encouraging librarians to adopt AI tools in a critical and reflective manner.

Figure 1 Artificial Intelligence and Digital Competence–Research Capability Model



The framework aligns with UTAUT and Self-Efficacy Theory in underscoring the importance of performance expectancy and self-belief in digital tasks, while the Diffusion of Innovations perspective explains how digital practices and AI adoption diffuse across professional communities. By synthesizing these perspectives, the model illustrates not only the statistical associations but also the behavioral and organizational mechanisms that shape research capability.

Rather than serving as a definitive theoretical validation, the framework offers a practical roadmap: institutions can use it to identify leverage points for professional development, policy formulation, and curricular design in library and information science education. Future studies may refine this model through longitudinal designs or structural equation modeling, enabling a deeper validation of its theoretical underpinnings.

Limitations and Future Directions

While the present study provides valuable insights into the predictive relationships among AI dependence, digital competence, and research capability, the findings are based exclusively on self-reported survey data. As such, the interpretations should be understood as indicative associations rather than definitive explanations of librarians' behaviors or institutional dynamics. To more

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deeply contextualize these quantitative results, future research should integrate qualitative methods such as interviews or focus groups. Such approaches would allow for richer exploration of the lived experiences of librarians, uncovering the nuances behind their survey responses and further validating the patterns observed in this study.

Beyond geographic coverage, it must also be recognized that the study did not examine institutional contexts in detail. Differences in funding support, organizational culture, and technological infrastructure across universities may shape how librarians build digital competence, adopt AI tools, and engage in research. These contextual influences were not captured in the present design, but they represent important factors for future inquiry, particularly in explaining variation across academic settings.

Finally, the absence of detailed demographic information such as age, educational qualifications, or professional experience limits the interpretation of subgroup differences. It is plausible, for instance, that early-career librarians may approach AI tools with greater ease, while senior colleagues may draw more on professional judgment or institutional authority in their research engagement. Without these variables, the findings remain aggregated and cannot capture such nuances. Future research that incorporates demographic profiles could provide a richer understanding of how professional background shapes the interplay of digital competence, AI reliance, and research capability.

Conclusion

This study is among the first to examine how artificial intelligence (AI) dependence and digital competence jointly predict the research capability of academic librarians in the Philippines. While findings revealed high levels of AI dependence and very high digital competence, self-reported research capability remained only moderate. Correlation and regression analyses confirmed both variables as significant predictors, with digital competence emerging as the stronger contributor.

These results underscore the dual role of digital transformation in librarianship: while AI and digital tools expand efficiency, productivity, and information access, translating these affordances into meaningful research output requires deeper engagement, critical digital literacy, and sustained professional development. The widespread use of intelligent systems illustrates the opportunities of automation but also raises concerns about overreliance, echoing earlier scholarship. In contrast, multidimensional digital competence, including content creation, security, communication, and media literacy, demonstrated a more direct and substantial impact on librarians' engagement with research.

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By integrating perspectives from the Unified Theory of Acceptance and Use of Technology (UTAUT), Self-Efficacy Theory, and the Diffusion of Innovations Theory, the study advances an original predictive framework (AIDC–RC) that goes beyond description to offer a conceptual roadmap for research capacity-building. This framework highlights that technological readiness alone is insufficient without psychological confidence and institutional support. The originality of this contribution lies in linking behavioral, technological, and cultural dimensions into a testable model specific to the Philippine academic library context.

The study also introduces practical innovation by aligning with the United Nations Sustainable Development Goals (SDGs), particularly SDG 4: Quality Education and SDG 9: Industry, Innovation, and Infrastructure. The AIDC–RC framework provides institutions with actionable insights for designing policies, professional development programs, and ethical AI integration strategies that directly strengthen librarians' role as both facilitators of information and contributors to scholarly inquiry.

In conclusion, librarians' research capability in the digital age is shaped by both technological and psychological readiness. Cultivating a balanced ecosystem, one that encourages ethical, critical, and strategic use of AI while embedding digital competence training and research mentorship, ensures librarians remain active drivers of educational innovation. The proposed AIDC–RC framework represents not only an empirical contribution but also an innovative foundation for future research. Subsequent studies may apply longitudinal and mixed-method designs, expand to diverse institutional contexts, and refine the framework to enhance its robustness and generalizability.

Acknowledgment and Declaration

The author used ChatGPT (GPT-5.1) only for language/statement construction (grammar, clarity). No AI was used to generate or analyze data, results, or references. The author reviewed/edited all AI-assisted text and take full responsibility.

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Appendix: Survey Instrument

Section I: AI Dependence (adapted from Morales-García et al., 2024)

Instructions: The following statements assess your reliance on artificial intelligence for tasks, decision-making, and professional growth. Please indicate the extent to which you agree or disagree with each statement by selecting the appropriate response:

Strongly Agree (5)

Agree (4)

Slightly Agree (3)

Disagree (2)

Strongly Disagree (1)

Choose the response that best reflects your perception of AI dependence.

Item	Strongly Agree (5)	Agree (4)	Slightly Agree (3)	Disagree (2)	Strongly Disagree (1)
1. I feel unprotected when I don't have access to artificial intelligence.					
2. I worry about delaying my tasks or projects if I don't use artificial intelligence.					
3. I do my best to stay current in artificial intelligence to remain relevant.					
4. I constantly need validation or feedback from artificial intelligence systems to feel confident in my decisions.					
5. I don't fear that artificial intelligence will replace my current skills or capabilities.					

Section II: Digital Competence (adapted from Mejías-Acosta et al., 2024)

Instructions: This section evaluates your digital competence in various aspects, including access to digital content, digital empathy, digital security, and the use of digital media for communication and creation. Please indicate the extent to which you agree or disagree with each statement using the following scale:

5 – Strongly Agree (I consistently demonstrate this ability)

4 – Agree (I frequently demonstrate this ability)

3 – Slightly Agree (I moderately demonstrate this ability)

2 – Disagree (I rarely demonstrate this ability)

1 – Strongly Disagree (I do not demonstrate this ability)

Answer each item truthfully based on your skills and experience.

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Item	Strongly Agree (5)	Agree (4)	Slightly Agree (3)	Disagree (2)	Strongly Disagree (1)
a. Access to Digital Media					
1. I have applications that keep me updated with the recent happenings.					
2. I can search for and access information in digital environments.					
3. I can use different media to store and manage information.					
4. I can search for the information I need on the internet.					
5. I can understand the information I obtain from the Internet.					
b. Digital Empathy					
6. I respect other people in digital environments.					
7. I take into account the opinions of others in digital environments.					
8. I can put myself in others' shoes in digital environments.					
9. I am willing to help other people in digital environments.					
10. I inform myself before commenting on a topic.					
c. Use of Digital Media					
11. I can complete digital content related to my tasks.					
12. I can use digital media to detect content plagiarism.					
13. I use digital media to solve tasks.					
14. I can create and edit digital content required in my tasks.					
15. I skilfully use digital software to complete tasks.					
d. Digital Security					
16. I avoid inappropriate behavior on social networks.					
17. I am careful with my personal information and that of others.					
18. I can identify harmful behaviors that can affect me.					
19. Before carrying out a digital activity, I evaluate the consequences.					
20. When sharing digital information, I consider my privacy and security.					
e. Communication of Digital Content					
21. I know how to communicate through different digital media.					
22. I can communicate with other people in digital environments.					
23. I know how to communicate with others differently (images, texts, videos, etc.).					

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Item	Strongly Agree (5)	Agree (4)	Slightly Agree (3)	Disagree (2)	Strongly Disagree (1)
24.I share information and content through digital tools.					
f. Creation of Digital Content					
25.I know different ways to create and edit digital content.					
26.I can transform information and organize it in different formats.					
27.I can present what I want to convey in digital environments.					

Section III: Research Capability (adapted from Sison, 2019)

Instructions: This section assesses your research capability, including your ability to conduct research, analyze data, and disseminate research findings. Your responses will help determine your proficiency in various research aspects. Please indicate the extent to which you agree or disagree with each statement using the following scale:

5 – Strongly Agree (I am highly capable in this research area)

4 – Agree (I am frequently capable in this research area)

3 – Slightly Agree (I am moderately capable in this research area)

2 – Disagree (I am rarely capable in this research area)

1 – Strongly Disagree (I am not capable in this research area)

Answer each question based on your actual research knowledge and experience.

Item	Strongly Agree (5)	Agree (4)	Slightly Agree (3)	Disagree (2)	Strongly Disagree (1)
a. Research Process					
1. I am highly capable of making summaries, conclusions, and recommendations.					
2. I am highly capable of choosing and describing the population.					
3. I can clearly define terms and concepts to be used in the study.					
4. I am highly capable of gathering necessary data.					
5. I am highly capable of reviewing related literature and studies.					
6. I am highly capable of choosing the topic of research.					
7. I am excellent at formulating research questions.					
8. I am excellent at identifying and designing appropriate research design and instruments to gather data.					
9. I am excellent at disseminating the research output to the audience (e.g. conferences, in-house forums).					

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Item	Strongly Agree (5)	Agree (4)	Slightly Agree (3)	Disagree (2)	Strongly Disagree (1)
10.I am highly capable of analyzing data (quantitatively or qualitatively).					
b. Research Involvement					
11.I actively participate in seminars/ workshops about research.					
12.I actively participate in in-house/ institutional research forum.					
13.I actively participate in local research forums/ conferences.					
14.I actively participate in regional research forums/ conferences.					
15.I actively participate in international research forums/ conferences.					
16.I actively publish my research papers in reputable local journals.					
17.I actively publish my research papers in reputable international journals.					

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Research Article

Exploration of Senior Services in Taiwan's Public Libraries in an Aged Society: A Case Study and Practical Analysis

Shan-Ju Lin Chang

Abstract

As population aging accelerates and the heterogeneity and diversity of older adults become more pronounced, library efforts to promote lifelong learning and reading for all have entered a professionalized stage characterized by age-differentiated and audience-segmented services. In response to the expanding cohort of older users, professional associations worldwide have issued guidelines for library services to older adults. Building on an inductive synthesis of these international guidelines and drawing on a series of roundtables, focus groups, and questionnaire surveys, my earlier work produced the first national set of guidelines in Taiwan addressing library and information services for older readers under the challenges of an aging society. Grounded in these prior data, the present study further analyzes service cases from domestic public libraries. It describes and critically examines operational practices and implementation experiences in selected cases, identifies practice-relevant research issues, develops instructional modules for services to older adults, and offers recommendations for both service design and research. The aim is to strengthen planning for services to older readers, enrich the substantive content of such services, and provide capacity-building training materials and practical references for library personnel across institutions.

Keywords: *Aged society, Public libraries, Senior services, Dementia friendly libraries, Guidelines for reader services*

SUMMARY

Background

Taiwan's demographic transition is both rapid and profound: the nation crossed the threshold into an "aged society" in 2018 and, by 2025, will be "super-aged," with those 65+ surpassing 20% of the population. The scale

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and speed of this shift reorder social arrangements and policy priorities across labor markets, taxation, pensions, household composition, mobility, health and care systems, and beyond. In this context, public libraries—already embedded as neighborhood hubs for information, learning, exchange, and cultural participation—face a dual imperative: to sustain inclusive access for diverse older adults while upgrading their service ecologies to support active, healthy, and dignified aging. The paper foregrounds that libraries must mobilize collections, spaces, programs, equipment, and digital technologies to become welcoming "third places" for later life learning and sociality.

Objectives

This study extends a prior national effort that synthesized international guidelines and, through roundtables, focus groups, and surveys, produced Taiwan's first set of Library & Information Services Guidelines for Older Readers (2019). Building on those data, the present work analyzes concrete service cases from Taiwan's public libraries to 1. describe and critically examine operational practices and implementation experiences; 2. identify practice-relevant research issues; 3. develop exemplar instructional modules for staff training; and 4. propose actionable recommendations that strengthen planning, program design, and evaluation. The overarching aim is to enrich the substantive content of senior services and provide capacity-building resources for practitioners.

Methodology

The paper combines a documentary analysis of international guidelines (IFLA; ALA/RUSA; CLA; ALIA; LIANZA; CILIP) with qualitative data from a 2019 national working group on older readers' services (six committee meetings, ~3.5 hours each; two focus groups, 90 and 100 minutes; 14 participants; ~23 hours of transcripts). In parallel, the team systematically gathered materials from 11 public libraries (practice documentation and activity photos), and subsequently extended the corpus through field-based professional development workshops across multiple regions and on-site evaluations of 17 branches in two municipalities in 2021. The project thus triangulates guideline synthesis, committee and focus group deliberations, workshop case sharing, and field visits as sources for case descriptions and cross-case analysis.

Conceptual Framework

A salient anchor for analysis is RUSA's 2017 Guidelines for Library Services with 60+ Audiences, which articulate eight dimensions: staff training; collections & services; programming; technology; outreach; services for the homebound & special populations; facilities; and funding/budgets. These domains reflect a

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shift toward multi-generational inclusion, language and cultural diversity, and the centrality of technology in later-life information practices—together reframing what "good" older-adult services look like at the branch level.

Case Highlights

Puli Township Library (Nantou County)

Puli illustrates a hybrid of place-making, reminiscence, and digital inclusion. Nostalgia-themed talks connect older residents to local memory ("old photos, old stories"), while tablet learning ("Happy Learning with Tablets") expands digital participation. An original "pulp-chair" co-creation project, inspired by local papermaking, invites older patrons to design and fabricate chairs that later populate the senior reading zone—an act of tangible authorship that deepens belonging. Critically, Puli piloted a dementia-inclusive volunteer model ("Brain-Healthy Volunteers"), partnering with the county health bureau and a hospital-based dementia care center (2019). Participants undertake suitable in-library roles with professional support, strengthening cognitive activation, reducing isolation, and modeling stigma-reducing, community-embedded inclusion.

Tainan Public Library and Yuwun Branch

Tainan offers a pre-renovation spatial adjustment that privileged ground-floor newspaper rooms for accessibility, and later, in the new main building (2021), advanced LIS-informed space concepts: a cooking classroom to structure five-senses learning (view, listen, touch, smell, taste) alongside related book displays, and a makerspace with sewing machines and craft tools that enable intergenerational, memory-rich creative sessions. These facilities exemplify how libraries can scaffold multi-modal learning and social participation for older adults within an inclusive third-place architecture.

Kaohsiung Public Library

The "Silver Life" campaign reframed reading as non-print, mobile, and participatory: guided walks, hands-on workshops, and curated booklists aligned to health, finance, end-of-life, and local memory themes; 45 branches joined, with 50+ events and nine deep-travel routes. The program's design foregrounded five-senses engagement and contextual reading, pairing itineraries and activity formats with targeted collections. This city-wide activation demonstrates how marketing, curation, and experience design can shift perceptions and reduce participation barriers among older residents.

Miaoli County Library and Town Libraries (Sanwan, Nanzhuang)

Miaoli's senior zone integrates optical magnifiers and curated selections; its "cognitive board games" initiative, seeded through professional learning, evolved into a weekly social learning community by reader demand—an example of how

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light-touch program seeding can yield durable, peer-led engagement. The county system also coordinates with adult education and senior learning centers, scaling reach through rotating book boxes and on-site co-learning that situate library programming in familiar community venues.

National Taiwan Library (NTL)

NTL's portfolio spans spatial re-location of the senior resources zone to the ground floor, partnerships with silver workforce centers, collaborations with performing arts institutions, and multi-agency dementia awareness programs (e.g., touring talks and workshops "Meeting Dementia at the Library" with 9 municipal partners). The library also builds bridges with hospitals and NGOs, offering curated booklists on aging/long-term care and hosting multi-sensory courses (music, drama, reminiscence) that embed health literacy and caregiver support into everyday library life.

Cross-Case Synthesis

Analyzed comparatively, the cases reveal coherent patterns across six design and delivery dimensions:

1. Facilities: Senior zones function best when ground-floor, proximate to restrooms and water, with appropriate furniture and lighting; emerging models add multi-purpose rooms for reminiscence therapy, nutrition education, and creative production. New main libraries since ~2018 showcase diversified, community-centered spatial repertoires.
2. Collections: Many branches now tie program-aligned displays (health, finance, end-of-life, local history) to talks and workshops to convert attention into borrowing and reading—turning events into engines for collection activation.
3. Services and Programs: The dominant trajectory is from print-centric to multi-sensory, socially embedded learning: board games for cognitive stimulation, music listening and song circles for emotional and neurological benefits, craft-based reminiscence, and digital literacy that respects older learners' pace and privacy. The Kaohsiung and Puli examples, in particular, illustrate how experience design bridges older adults into reading and information practices beyond print.
4. Staffing and Volunteers: RUSA's emphasis on staff training is reflected in practice: gerontology-informed etiquette, an eye to heterogeneity, and the strategic recruitment of older volunteers. The dementia-inclusive volunteer model demonstrates how libraries can reposition older adults not only as service recipients but as co-producers of value and social connection.
5. Partnerships and Outreach: Cross-sector ties—with hospitals and clinics, health bureaus, schools, NGOs, and senior learning centers—extend reach to

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homebound patrons, enable intergenerational learning, and inject specialized expertise (e.g., dementia literacy, fall prevention, nutrition) into library programs. The strongest cases are ecosystemic, aligning space, program, collection, and partner capabilities.

6. Equipment and Assistive Technologies: Optical aids, accessible seating, clear wayfinding, and thoughtful placement of digital devices matter; the lesson is that technology succeeds when embedded in safe, stigma-free settings with patient facilitation—an insight surfaced by observations where certain devices under-performed due to glare, awkward placement, or social discomfort about public learning (Synthesis from multiple case notes in the study.)

Implications for LIS

First, design for heterogeneity: segment by functional abilities, interests, and learning goals—not by age alone—and calibrate offerings to span the spectrum from robust, active seniors to oldest-old cohorts where dementia-friendliness and caregiver supports are paramount. (The paper notes the growing 85+ "old-old" group and the relative paucity of dementia-specific services system-wide.)

Second, embed health and wellbeing as legitimate objectives of library work. Programs that build health literacy, digital inclusion, cognitive stimulation, and social connectedness are not "extras" but core expressions of the public library's social mission in an aging society—as echoed in RUSA 2017's technology and homebound/special populations dimensions and in the study's city-scale activation and national-library outreach.

Third, measure what matters. The study's cases suggest tractable indicators: participation profiles (who shows up, who doesn't), social and intergenerational mixing, cognitive engagement proxies (e.g., frequency and retention in board game clubs), digital self-efficacy gains, and qualitative markers of belonging and reduced isolation. These can be folded into annual planning cycles under the funding/budgets and staff training domains of RUSA.

Fourth, treat "programs" as part of an ecosystem. The strongest examples align space + service + collection + people + partners, e.g., Kaohsiung's non-print reading journeys marshaling city branches, curated booklists, and themed routes; Puli's clinically supported, dementia-inclusive volunteering paired with nostalgia programming and tablet classes; NTL's cross-agency, touring dementia literacy.

Conclusion

The paper ultimately positions public libraries as social infrastructure for aging well—"third places" where older adults gather, learn, maintain health, and feel safe—supported by greenery, vigilant staff, and emergency readiness. In this

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reading, the building is more than a container for collections: it is an enabling platform where information, human connection, and creative expression intersect to sustain independence and dignity in later life. As the cases show, Taiwan's libraries are already moving from print-centric service toward multi-sensory, partnership-rich ecosystems that honor older adults as both beneficiaries and contributors. Scaling these practices—through staff development, inclusive design, and evidence-informed planning—will help libraries deliver on their promise as healthy-living infrastructure for a super-aged society.

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研究論文

高齡社會中台灣公共圖書館老年服務之探討－個案研究與實務分析

林珊如

摘要

隨著社會人口老化現象的加速，面對高齡人口的異質性與多樣性，世界各國專業組織因應高齡服務族群之成長，已陸續提出圖書館高齡服務相關指引。筆者先前藉由歸納分析各國相關服務指引，透過一系列座談、焦點團體訪談與問卷調查，產出國內第一份有關高齡社會挑戰下的老年讀者圖書資訊服務指引。本研究建基於先前之研究資料，進一步分析國內公共圖書館服務實例，分別描述、分析個案實務操作與執行經驗，瞭解實務相關研究議題，期能建立老年資訊服務教案並提出相關服務與研究建議，提供各館人力資源培力教材與實務工作之參考，以提升高齡社會中老年讀者服務之內涵。

關鍵詞：高齡社會，公共圖書館，老年服務，失智友善圖書館，讀者服務指引

研究背景

根據聯合國的觀察，全球人口快速老化是人類歷史上從未出現過的情況，其影響範圍遍及經濟與社會的多個層面。例如，勞動力結構、稅收組成、養老金制度，乃至於家庭樣態、居住安排、人口遷徙，以及醫療與健康照護等，都將因人口結構的轉變而面臨挑戰。若各國未及早正視並提出對策，勢必在問題浮現時陷入困境（United Nations, Department of Economic and Social Affairs, Population Division, 2015）。依國家發展委員會（2018）的推估，台灣已在2018年正式邁入「高齡社會」，並於2025年進一步成為「超高齡社會」，亦即65歲以上人口比例分別突破14%與20%。相比英國、美國、法國等國，台灣高齡人口

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此篇文章之同儕評閱意見報告（Open Point）及導讀簡報（InSight Point）請至本刊網站查閱
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比例上升的速度更為驚人；在亞洲地區，僅與南韓相當，甚至可能因少子化加劇而出現超越南韓的情況。

自2010年起，台灣的人口老化趨勢愈發明顯，人口組成的變化對人力資源品質、經濟與社會制度的永續運作、醫療照護系統，以及銀髮產業的發展，皆帶來前所未有的衝擊與契機。行政院相關部會於同年即提出政策建議，內容涵蓋：整合性生活照護（如送餐、照顧服務與外籍看護管理）、無障礙生活環境（輔具、住宅設計與交通工具）、醫療與保健（醫療器材、藥品、預防保健及養生）、教育與進修、旅遊與文康休閒、以及金融保險與信託服務（行政院經濟建設委員會，2012）。可見人口老化是一項跨領域的議題，涉及社會工作、醫療、心理、工程、財務、成人教育、圖書資訊以及休閒活動等多方面。

除了高齡化的社會趨勢，資訊科技的快速發展與智慧行動裝置的普及，也凸顯了提升高齡者資訊素養與科技使用能力的重要性（楊培珊、林珊如，2014）。公共圖書館作為在地的資訊、交流、學習與展演中心，如何運用館藏、服務、空間、設施、活動與數位科技，打造高齡友善的環境，並成為長者願意參與的「第三空間」與終身學習據點，正是專業人員亟需思考的方向。

2008年起，台灣公共圖書館率先成立以55歲以上族群為對象的樂齡學習中心，例如臺北市立圖書館總館、三民分館、葫蘆堵分館等，開啟了在館內設置樂齡專區的先例。十多年來，各地圖書館的服務多以健康且具備行動能力的長者為主要對象。然而，隨著人口結構進一步變動，「老老族群」（85歲以上）的快速增加，使失能與失智的預防與延緩成為迫切課題。遺憾的是，目前圖書館界對高齡者，特別是失智長者的資訊需求，關注仍相對有限。面對人口老化帶來的挑戰，圖書館界亟需投入更多資源，發展全面而具體的回應策略。

二、研究目的

面對全球及台灣高齡人口快速增長的挑戰，圖書館界必須預備好迎接高齡及超高齡社會的來臨，具體提供老年讀者服務，促進高齡人口的活躍老化、健康老化。為此，本研究之前期計畫已於2019年完成，產出國內第一份有關高齡社會挑戰下的老年讀者圖書資訊服務指引（國家圖書館，2019）。本計畫則以各國老年相關服務指引與研究調查文獻為基礎，並蒐集國內老年服務實際案例，分析比較台灣相關實務的現況、挑戰與機會，以提供館員培力之教案與服務規劃之建議，期望圖書館在預備及提供老年圖書資訊服務時有所依據，並透過集體的努力，讓公共圖書館成為高齡社會老年生活的好夥伴。

本研究計畫建基於先前之研究資料，進一步分析國內參與老年服務指引之公共圖書館老年服務實例及近年文獻蒐集之案例，分別描述、分析個案實務操作與執行經驗，瞭解實務相關研究議題，建立老年服務教案範例並提出服務與

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研究建議，期有效促進圖書館提供老年讀者服務之規劃，提升老年讀者服務內涵，並提供各館人力資源培力教材與實務研究規劃之參考。

三、研究方法

為建立老年服務教案與服務規劃建議，本研究主要資料來源為筆者於2019年主持之老年服務指南研訂小組座談會議及焦點團體所蒐集之實徵性資料，輔以國外相關指引及文獻報告分析。

本研究之資料來源蒐集之經過，乃先從文獻回顧探討各國相關指引的精神與實務操作原則，歸納共同之重點面向，作為台灣老年服務指引研訂的參考依據。再由筆者於2019年4月至6月期間，邀請國內有相關實務經驗或業務的在職館員組成老年讀者圖書資訊服務指引研訂小組，以美國圖書館學會（American Library Association，簡稱ALA）下屬的參考與使用者服務協會（Reference and User Services Association，簡稱RUSA）2017老年服務指引為基礎進行各面向的討論與回應，包括六次研訂小組會議（每場約三小時半）與兩場焦點團體座談，共14位參與者（時長各為90分及100分鐘），共計產生23小時長的言談資料，除整體性綜合分析歸納出台灣老年服務指引內容，個案部分則有待進一步分析；此期間有系統地蒐集了國內各地11個公共圖書館於老年讀者服務實務經驗與活動照片等檔資料，透過逐字稿的整理分析與比較歸納，形成難得的老年服務教案來源。

此外，筆者於2020年國家圖書館為全國在職館員規劃之「公共圖書館營運管理及創新發展系列工作坊」之「樂齡讀者服務」專題工作坊擔任講師，並在台南、高雄、台東、苗栗、基隆等地巡迴進行相同主題的在職館員培訓，透過培訓過程中的個案分享，亦蒐集參與成員館之相關實務操作、成果與挑戰等第一線服務經驗內容，可以大幅提升研究者在質性資料分析與詮釋之品質。本研究執行期間（2021年），筆者受邀擔任基隆市立圖書館（九個分館）及新北市立圖書館（八個分館）評鑑委員，根據各分館的自我評鑑資料及簡報，並實地訪視兩市共17個分館，進一步為本研究提供了豐富的個案資料來源。綜合上述，本研究以個案研究為取向，以焦點訪談與實地田野調查所得資料進行內容分析，以個案描述與討論呈現研究結果。

四、文獻回顧

在本研究前期，筆者曾系統性梳理全球針對高齡族群所發表之公共圖書館服務準則。結果顯示，多個圖書資訊專業團體已發布相關文件，包括：國際圖書館協會聯合會（International Federation of Library Associations and Institutions [IFLA], 2000）所發表的*Guidelines for Libraries Serving Hospital Patients and the*

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Elderly and Disabled in Long-term Care Facilities、美國圖書館學會參考與使用者服務協會（RUSA, 2017）的*Guidelines for Library Services with 60+ Audience: Best Practices*、加拿大圖書館學會（Canadian Library Association [CLA], 2002）的*Interest Groupon Services to Older People*、澳洲圖書資訊學會（Australian Library and Information Association [ALIA], 2012）的*Beyond a Quality Service: Strengthening the Social Fabric–Standards and Guidelines for Australian Public Libraries*、紐西蘭圖書館與資訊服務學會（Library and Information Association of New Zealand Aotearoa [LIANZA], 2004）的*Standards for New Zealand Public Libraries*，以及英國圖書館與資訊專業學會（Chartered Institute of Library and Information Professionals [CILIP], 2023）的*Managing Safe and Inclusive Public Library Services*等。

若從發表脈絡回溯，較早期的代表性文本為IFLA於2000年公布之*Guidelines for Libraries Serving Hospital Patients and the Elderly and Disabled in Long-term Care Facilities*，並於2007年針對失智者服務發表*Guidelines for library services to persons with dementia*（Mortensen & Nielsen, 2007）。另一條重要發展軸線則來自ALA下屬的參考與使用者服務協會（RUSA）。RUSA自1987年推出首版老年讀者服務準則，之後持續修訂，最新版本為2017年所頒佈的*Guidelines for Library Services with 60+ Audience: Best Practices*。為觀察兩版本在10年間服務理念與實務操作上的變化與趨勢，本文亦納入2008年版作為對照材料。

2017年RUSA指引將「60歲以上讀者」之服務規劃區分為八大面向，形成可供館員採行的指導原則，包括：㈠專業人力培育（staff training）、㈡資源與服務配置（collection and services）、㈢方案與活動設計（programming）、㈣數位與技術導入（technology）、㈤社區連結與推廣（outreach）、㈥居家與特需族群服務（services to the homebound and special populations）、㈦空間與設備優化（facilities）、㈧經費與預算管理（funding and budgets; Reference and User Services Association [RUSA], 2017）。

相較之下，2008年版在年齡認定上並未採聯合國標準，而以ALA的界定（55歲含以上）為依據；其核心立場可濃縮為兩點：其一，充分意識並回應高齡群體的差異性；其二，主動破除關於高齡服務的刻板印象。該版聚焦的重點可歸納為七個實作取向：㈠以老年人口資料為基礎，將其系統性納入計畫與預算；㈡使館藏、活動與服務切合在地年長者的興趣與需求；㈢保障年長者對館內空間與硬體感到安全、舒適與具吸引力；㈣強化圖書館作為高齡資訊服務樞紐的功能；㈤在整體規劃中明確設定高齡者為優先服務族群；㈥主動觸及無法到館的長者並提供替代管道；㈦落實館員之禮貌、尊重與專業服務之培訓（RUSA, 2008）。

兩個版本相距約10年，差異最突出的是對多世代並存的文化以及語言多元性的強化關注（RUSA, 2017）。同時，2017年版新增了「科技應用」與「居家與

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特殊族群服務」兩大構面，回應了科技進步與壽命延長所帶出的新型態需求；在「活躍老化」的框架下，「數位老化」（digital aging）日益凸顯其關鍵性（楊培珊、林珊如，2014），促使圖書館在科技服務與老年資訊素養教育上須有更積極的布局。值得注意的是，指引結構之優先序也出現位移：2017年版將「人員培訓」提升為首要面向，且不再僅以態度養成為重，而是強調館員對高齡身心理特徵之共通性與異質性的敏銳覺察，並結合老年醫學、心理學、社會學等跨域知識強化專業能力（林珊如、楊培珊，2008）。

就其他國家之指引形態而言，撰寫風格與編排頗具差異，有的採條列式，有的偏重論述；多數國家以65歲以上作為高齡者定義。這些指引通常先描繪高齡社會的整體情勢（如長者人口比例攀升），繼而梳理高齡者的身心與資訊特徵、常見的需求與挑戰，並提出圖書館應進行的社區需求與資源盤點，以及跨強調部門合作的方向與服務清單。

在案例呈現與評估機制上，各國也有差異。澳洲與英國常於文本後附上國內案例，有利於讀者對照參考；美國與澳洲特別強調應提升圖書館在高齡社會中的角色定位與能見度，主張在提供服務的同時，也要有策略地宣傳服務本身與機構價值。至於成效評估工具，英國與紐西蘭分別提供檢核表與落實評估的提醒，供館方採用。

綜觀各國公共圖書館高齡服務指引，其共通核心在於把握高齡社會脈動、履行社會責任。無論是館員培育、館內資源與服務、或社區外展，皆應以開放心態與跨域協作為前提，公平、積極地回應多元需求；同時，深化高齡議題的敏感度，破除年齡歧視，促進社會包容，建構友善環境，並以終身學習作為支持活躍與健康老化的關鍵路徑。

在台灣的實務推進上，國家圖書館於2019年委託林珊如教授統籌研擬「臺灣老年讀者服務指引」計畫。該計畫以國外指引的內容分析為基礎，結合台灣高齡社會現況與公共圖書館服務生態，提出10項重點方向（國家圖書館，2019），其主要意涵可概括如下：㈠強化館員專業培力；㈡蒐整並理解在地高齡人口結構與需求樣態；㈢將高齡者系統性地納入服務規劃、館藏發展與經費配置；㈣建立專業諮詢與合作管道；㈤提供切合高齡者使用情境的資訊與科技服務；㈥確保館藏、空間與設備對高齡友善；㈦鼓勵高齡者投入志工服務；㈧對困居者完善居家與外展服務機制；㈨關注失智議題並設計相應服務；㈩建置並運用服務成效評估工具。該指引亦特別指出，高齡讀者之圖書資訊服務不應限於文字閱讀推廣，更應涵蓋聽、說、讀、寫、觀賞、手作、桌遊等多感官與多形式的學習與參與，擴大圖書館在高齡終身學習與社會參與上的支持度與可近性。

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然而，國內公共圖書館包含六個直轄市的總館與分館，與縣市文化局圖書館及其轄下輔導之各鄉鎮圖書館，規模大小不一，各館由於老化人口結構與地方資源不盡相同，在實務面上老年服務現況如何、館員對老年服務指引的認同程度如何等問題，有待進一步調查研究。以下針對所蒐集之實地研究與焦點團體訪談資料進一步分析國內公共圖書館服務實例，分別描述、分析個案實務操作與執行經驗，以瞭解實務相關研究議題。而隨著台灣於2025年邁入超高齡社會，近年更多公共圖書館投入樂齡主題館的發展或創辦跨域的老年服務，見諸文獻的相關案例並於內文一併加以探討。

五、個案分析

透過文獻及個案圖書館的業務介紹與實地訪評，本研究發現國內公共圖書館針對年長者主要著重在吸引讀者前來使用圖書館，年長者主要館內活動為閱讀報刊及借閱書籍；對長者資源提供以書報為主，少有相關視聽資料或數位資源；館舍空間改造持續朝向分齡分眾進行，為長者設置樂齡區；服務方案漸漸多元化，除了讀書會、課程、演講等，近年開始提供益智桌遊、手作與走讀活動；但服務對象仍偏向單一種類，即健康老人；外展服務仍有待努力；各階層與各類老年服務設計與推廣行銷則有待加強。

綜合學者專家研究指出，公共圖書館的老年讀者服務目標主要有二：拓展老年閱讀人口，以及提供不同處境的長者需要或感興趣的服務。此處的閱讀筆者認為應以廣義的閱讀視之，包括協助老年人口透過不同感官學習新知，以期健康老化並提升其生活品質。以下是本研究中的個案公共圖書館在這兩個目標引導下的努力與思考，期可作為同道之參考。

㈠南投縣埔里鎮立圖書館

就鄉鎮圖書館層級而言，埔里圖書館是最早針在空間改造時，即針對長者設置獨立的空間；於一樓設立「老吾寶學堂」，提供空間舒適、館藏集中的樂齡讀者專區。也與當地樂齡學習中心合作，委託其辦理生活美學課程，由圖書館提供場地，分館主任強調，圖書館辦活動理念在於重質不重量，也希望多一點不同的人參與，避免資源總是同一群人使用。由於館員人力有限，也對外尋求醫院合作辦活動，由圖書館提供場地。埔里鎮立圖書館的特色在針對高齡者提供一系列的懷舊活動與數位推廣服務，項目列舉如下：

1. 舉辦懷舊講座：引導長者進入圖書館使用館藏，整合文化部經費，辦理最受喜愛的懷舊講座，包括「老照片老故事」、「宗教埔里」、「歷史埔里」等主題，邀請長者一起回顧當地文史，引發老年讀者的共鳴。
2. 樂齡快樂學平板活動，由館方提供10部平板，其餘由參加學員自行攜帶，效果良好。

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3. 祖孫節親子活動，與埔里榮民醫院合作，由圖書館志工在醫院大廳說故事，結合手作DIY活動。由於醫院積極行銷，活動參與十分踴躍，人數眾多。
4. 圖書館紙漿椅創作：此為埔里鎮立圖書館之創新服務。圖書館員結合當地造紙業特色，邀請長輩參與圖書館紙漿椅製作。由美學講師帶領，從構圖設計>票選>骨架焊接>分層，將紙漿塗抹在骨架上，然後乾燥。草間彌生的原點創作課程，以馬賽克拼貼做成成品，讓長者有全程參與創作的成就感。紙漿座椅完成後即放置於館內老吾寶學堂閱讀區，長輩們對圖書館更有歸屬感。

埔里鎮立圖書館也以跨域協作為亮點，首度在全台導入讓失智長者參與館務的志願服務模式。2019年9月，館方與南投縣政府衛生局及埔里基督教醫院之失智共照中心合作推出「健腦長者」計畫，安排合適的館內工作，透過規律到館與情境互動達到認知活化、延緩退化之目的。參與者在服務過程中得以與一般讀者自然交流，避免社會孤立，同時也提升民眾對失智議題的理解與接納。為確保現場支持與安全，方案啟動前即由醫護專業團隊為館員進行失智識能與應對技巧培訓。此一制度化作法，使該館成為國內首座將失智者納入志工體系的失智友善公共圖書館。

㈡臺南市立圖書館與東區裕文分館

臺南市立圖書館（以下簡稱臺南市圖）總館在新館落成前，曾為長者調整空間應用。過去總館的閱報空間需要爬樓梯，對長者是不便利的，改建後將一樓方便最好的閱報空間留給長者使用。

此外，東區裕文分館曾與外部單位合作。例如與社區資源結合，辦理失智症照顧課程，也曾與嘉南療養院顏世卿老師合作開辦健康主題的活動，結果發現平常不曾前來圖書館的長者也來館利用。

臺南市圖新總館於2021年1月落成，也成為台南旅遊新景點，除了嶄新的空間設計，並有融入社區資訊學的理念，吸引民眾前來的創新服務與各種社區功能的空間。例如配備教學設備的烹飪教室，可提供混齡的交流活動，不同家庭的親子同來，講師在教室中先以影片教導學員認識有機農法與作物，現場並有真實的蔬果可供觀察與討論，最後實際可進行烹飪示範，提供以眼觀看、以耳聽講、以手觸摸、以鼻聞香、以口品嚐烹飪成品的五感學習。配合一旁相關的主題書展，同時也推廣閱讀。此外，新總館也提供有縫紉機等舊時工藝工具的創客空間，可提供長者進行懷舊創作活動，並有志工輪值適時提供使用者需要的協助。

以上這些新創的空間與創新的服務，揭示現代公共圖書館的新角色新功能。特別在高齡社會中，現代公共圖書館作為一個社會性的基礎設施，提供各種年齡層安靜閱讀與人際交流的空間，促成青銀共融、跨世代互動的機會，在少子化與高齡化的社會發展中，成為越來越多的獨居老人或相關的照護者一個

可自在獨處、可學習各種新知、並感到安全的地方，具有凝聚社區成員的多功能公共圖書館更凸顯價值與其重要性。

㈢高雄市立總圖書館

高雄市立圖書館在長者服務上的特點可見於2019年為順應世界閱讀日推出以「走讀」為核心的樂齡閱讀推動方案。這個方案以雙關標語「人生銀家」非你不可／「人生銀家」非你Book ！為號召，主打「非紙本」的閱讀體驗，讓長輩透過實地走訪與動手操作同樣能獲取知識。

面對台灣快速邁向高齡社會、許多銀髮族因感官與體力退化而減少閱讀的現況，高市圖以「人生銀家」作為年度主題，響應文化部「非走BOOK–閱讀體驗路徑」。活動不再侷限於紙本，而是以導覽、實作與情境參與，重新打開長者親近閱讀的入口。本計畫於2019年4月20日至2019年5月5日展開為期兩週活動，由總館串連45間分館，同步推出主題書展與推廣方案，圍繞三大主軸：「非讀BOOK」、「非做BOOK」、「非走BOOK」。全館總計辦理50場以上活動，並規劃九條高雄深度旅行路線，搭配書單帶領民眾以閱讀回望城市記憶，活動各項內容如下（Open Book閱讀誌，2019）：

- 「人生銀家－非讀BOOK」：總館與合作分館設置樂齡主題書展，精選長者高度關心的議題，例如心靈療癒、健康飲食、臨終教育、高齡財務管理等。這類聚焦式策展，一方面擴大長者選書面向，另一方面也協助所有讀者提早思考並理解未來的老年生活。
- 「人生銀家－非做BOOK」：以體驗課程取代單向講座，培養長輩規律接觸閱讀的習慣與動機，課程涵蓋集體創作、瑜珈、3C基礎操作、品茶、手作等多元主題。

各館實例包括：

- 寶珠分館：以法式不凋玫瑰花創作為題，引導長者完成進口花材作品，強化手眼協調並培養美感。
- 橋頭分館：結合在地黑糖、中藥與香草製作滋潤芳香手工皂，透過嗅覺與觸覺刺激，活化大腦並促進養生。
- 林園分館：邀請長輩回溯農村時期牛車記憶，共同描繪潭頭社區的舊時風景，將個人回憶轉化為社區圖像。

高雄市圖「人生銀家」的活動設計亮點在於提供長者多樣化的五感閱讀。靜態的主題書展，選書是重點，書目符合長者需求或興趣就促進成功老化。動態的深度走讀活動並外加推薦閱讀書單，進一步推廣圖書館館藏是本次走讀活動的特點，也十分值得同道學習。

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手作活動結合在地特產製作手工皂，提供閱讀推廣活動中少有的嗅覺與觸覺之刺激活化大腦令人欣喜，若也能結合推薦館藏中圖文並茂的書籍，讓學員當下借回家翻閱與家人共讀，又是延伸閱讀推廣的策略。嗅覺與觸覺之刺激活動結合小型書展的設計值得推廣，可結合各館當地特產創意發想。

邀請長輩回憶舊時場景共同創作繪本，是一種提供認知刺激的懷舊療法。除一般健康長者外，特別適合識字不多的社區長者。透過讓長者回憶、口說表達、繪畫剪貼等互動交流的機會，提供陪伴、賦能（empower）、與保有創作力的自信，同時也提供了長者間的社會連結，即幫助高齡社區長者朝向活躍老化的重要一步。

圖書館也可以在懷舊活動中推廣館藏中的老照片，作為開啟話題的媒介。而許多台灣老照片已數位化，更可利用瀏覽數位老照片活動帶入教導如何使用館藏中的數位資源。除了開辦老年資訊素養課程，圖書館員透過此類情境式教學，也可漸漸培養出長者的數位素養，在數位時代與高齡社會雙重發展趨勢下是長者十分重要的新知能。

整體而言，「人生銀家」系列以情境化、可參與、可移動的閱讀經驗，回應不同偏好的高齡者在學習與社交的需求，實現圖書館作為在地學習與生活支持據點的角色。

㈣新北市立圖書館三峽及鶯歌分館

三峽北大分館為一綜合性建築空間，有托老及托幼中心。人口特性因附近退休人員多，具高等教育背景，年長者有自己閱讀的習慣。館藏使用率高。北大分館曾與托老中心合作，透過活動設計，帶領小朋友與失智老人互動。該中心主任表示，透過活動，老年人回去後比較多話，年輕人與小孩也較瞭解如何與老人互動。但需留意失智老人有時有待不住等較難控制的情形。另一間三峽分館的老年人較為傳統，較少如北大分館這類讀者。故三峽分館與區公所合作，每月一次，於老人共餐時間，在圖書館樓下的活動中心提供長者服務、帶活動。

鶯歌分館兒童室提供桌遊，亦有專門給老人玩的玩具。亦曾與宗教團體合作開設長青班，上課主題如健康、理財等，該宗教團體在多處設點開課，如安養中心。鶯歌分館也會與里長合作，提供樂齡服務。服務同仁分享國外實驗研究「與二十年前一模一樣」，深信年老是一種氛圍並非不可改變，透過心態轉變能讓自己更加年輕，因此更能積極推動樂齡服務。

從上面三個分館的發展看出，不同地方的長者有不同的人口特性，也有不同的歷史淵源，對在地長者提供的服務方式也應不同，方能吸引在地長者前來認識圖書館，進一步提供能滿足在地需求的服務。因此，沒有一體適用的老年

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服務；館員對老年人的異質性是需要有所認識，應具備老人學的知識以便深入瞭解不同特性的年長者之需求。而這也是RUSA（2017）老年服務指引中的首要項目。

㈤新北市立圖書館瑞芳及平溪分館

瑞芳與平溪地屬新北市的偏遠地區，瑞芳人口較多，平溪人口最少。平溪分館相較其他分館，屬新改建分館，於2015年重新營運。空間家具相對新穎。平溪當地幾無就業機會，65歲在此算年輕，樂齡讀者年紀多為85歲以上。出來參與活動者以女性多男性少，推廣活動設計以手作活動居多，讀者群固定，屬於這社區的健康長者，亦是各單位辦活動的重點人力資源。

新北市於2017年推長照服務，衛生局經費較多，希望推動社區服務，所辦活動與圖書館活動類型相像。75歲長者不識字，需要透過視聽資料或面對面引導的方式推廣，最吸引當地老人的是手作活動。

2018年開始與衛生所合作「動健康」課程，由專業種子老師帶領當地長者動一動、延緩失能，亦結合樂齡日活動，一次兩小時，合作愉快。2019年曾與「一粒麥子」基金會合作。

平溪只有一所國中與鄰近幾間小學，因距離近之故與小學合作，舉辦祖孫節共讀，由長者教小學生童謠等活動，透過童謠歌詞識字，透過唱謠老幼同樂！

平溪的案例是典型偏鄉的高齡社區。除了適合識字不多的長者之手作與律動之活動，透過跨世代共融的歌謠讀唱的背後也具有認知刺激的功能。神經科學家Kraus（2021/2022）在大腦這樣「聽」：大腦如何處理聲音，並影響你對世界的認識（*Of Sound Mind: How Our Brain Constructs a Meaningful Sonic World*）一書中指出，音樂有促進健康，甚至治療疾病的效能，鼓勵大家用好聲音如聽音樂、歌唱來減緩老化。在動靜空間兼容並蓄的現代圖書館或在館外公園，若條件合適，「音樂處方箋」應獲得更多的關注與推廣。

㈥新北市立圖書館三重分館與三重南區分館

三重分館主任表示，該區雖然流氓、遊民多，三重分館每週六辦理健康講座、搭配書展，讀者可順便借書回去。圖書館並將場地借予松年大學，辦理書畫班、KTV課、花藝班等。KTV雖略有聲音，但當地讀者尚能接受。三重曾是台灣黑膠唱片製造大本營，三重南區分館以黑膠唱片為主題，具有懷舊功能，是以「友善樂齡」為發展方向。同時，該分館也提供「共融玩具」，使用對象亦包含樂齡讀者。

正如上述平溪的案例分析，以音樂館藏為特色的三重分館（或如臺南市圖許石音樂圖書館），都有條件透過好聲音來豐富超高齡社會中長者的生活品質。

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介紹館藏中的東西方音樂家、樂器，舉辦音樂聆賞會，或鼓勵長者成立用聽的讀書會，如音樂同好會，對年長者而言也是容易走入圖書館的良善誘因。

㈦臺北市立圖書館景美分館

臺北市立圖書館（以下簡稱臺北市圖）景美分館之所在的五樓是失智症中心，該中心每週有兩天會將患者帶到圖書館活動。智障患者具有安靜卻無法專注閱讀的特性。館員反應他們是容易照顧的客群，無干擾行為，一般民眾熟悉他們的存在；其中有部分失智老人在頭腦清楚的狀況下，會不斷地發問。館員透過合作服務，在實務中接觸這些患者，這是一個已具備發展失智友善圖書館的場所，但更完整的服務仍有待開發。主任表示，館員與志工的培訓也需要同時看重。

台北市是高齡人口佔比很高的城市，65 歲以上的人口有 22.5%，僅次於嘉義縣 22.8%（中華民國內政部，2024）。隨著壽命增長人口老化，失智人口也上升（台灣失智症協會，2025）。公共圖書館在推廣認識失智症、消除社會歧視、以及協助社區中失智照護家庭的挑戰責無旁貸。

特別值得一提的是臺北市圖於 2023 年與臺北市立聯合醫院失智症中心合作，共同推出「閱讀處方箋」，透過市圖館藏，推薦書單上線並舉辦實體閱讀工作坊。透過選一本書醫師與失智症家庭照顧者共讀，交流，解惑。根據報導，參與者滿意讀達 99% 以上，反映出高齡社會迫切的需要（鄭宜芬，2023）。

正如許多縣市均倡導邁向失智友善城市，國健署也推動「失智友善社區」，全國公共圖書館如何朝向失智友善圖書館服務規劃，必須是未來共同努力的方向。

㈧苗栗縣立圖書館

苗栗縣立圖書館在館藏規劃上，特別將分類號 400-419 應用科學書區與一樓期刊閱報室整合，成立專屬的「樂齡專區」。該專區除提供主題性選書外，並配備光學放大鏡，以協助年長者能更輕鬆地閱讀。選書來源主要依循三個管道：讀者推薦清單、專區館員於線上書店搜尋，以及合約供應商定期提供的新書目錄作為篩選依據。

在課程與活動開發方面，多半源於館員與長者互動時發現的需求，或來自參與研習課程後獲取的靈感。舉例而言，有館員在國立公共資訊圖書館參與桌遊活動後，便將該概念帶回苗栗縣立圖書館實踐，並邀請專業講師帶領桌遊活動。此舉獲得熱烈迴響，館內志工認為能幫助延緩腦部退化，參與的民眾甚至自行號召近 20 人，並主動申請圖書館場地延續活動，使館方成功吸引到新讀者群。此外，館方亦透過制度面合作，串連教育處轄下的樂齡中心與幸福學院共同辦理活動，並積極推展高齡志工服務。苗栗縣立圖書館針對高齡者提供的主要服務與活動項目包括：

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1.「自信忘齡．樂活人生」系列講座：規劃針對退休族與中高齡者高度關心的主題，包括健康促進、疾病預防、旅遊規劃、家庭互動、理財與益智休閒等，幫助長者面對身心變化並維持正向生活態度。2019年另開設祖孫共學的氣球創作課程，促進跨世代交流。
2. 主題書展：結合國立公共資訊圖書館提供的「樂齡書箱」借閱服務，依照講座內容精選展書，並舉辦為期兩個月的專題書展。
3.「逆齡自主學習．益智桌遊」活動：透過教育部多元閱讀計畫補助購置桌遊，於2018年起試辦，讓年長者體驗桌遊在腦力活化上的功能。2019年開始，因讀者主動提出需求，活動固定於每週三下午舉行，並逐漸發展為長者社群聚會平台，增進人際互動與智力刺激。

由於苗栗縣立圖書館隸屬教育局，其對外合作的主要夥伴多為縣內學校及社區樂齡學習中心，例如三灣鄉立圖書館及南庄鄉立圖書館，共同規劃並推展多樣化的樂齡服務。

㈨苗栗縣三灣與南庄鄉立圖書館

作為苗栗縣獲獎紀錄最豐的鄉立圖書館，三灣鄉立圖書館的高齡服務呈現下列特色：

1. 館內專屬支持：設置「樂齡主題」書架，並規劃系列課程與活動；內容包含文化走讀、〈銀髮E世代〉手機／平板操作課程，以及各式樂齡專題講座。
2. 需求導向課程設計：以輕鬆、不造成學習負擔的主題為優先，例如強化社交連結的走讀活動，與貼近日常的3C數位技能課。
3. 穩定的跨機構合作：與三灣國小、三灣樂齡學習中心等在地單位共同開課與辦理活動。
4. 多元宣傳管道：運用圖書館的Facebook專頁與LINE群組擴大訊息觸及。
5. 志工系統運作：志工協助課程與活動的行政與現場工作，包括簽到、場地布置與收整等。
6. 無法到館者之服務：提供「溫馨托送」模式，由志工與讀者約定交接地點完成取書，降低使用門檻。

另一具有特色的南庄鄉立圖書館的服務重點在深入社區、貼近日常：

1. 巡迴書箱：服務對象涵蓋國小與偏遠之南富社區；書箱寄送至社區活動中心由人員管理，並以大約一至一個半月為週期更新館藏。
2. 場域共學：與社區活動中心協力辦理活動，將圖書館的靜態閱讀推廣與手作課程結合，讓長者在熟悉的場域中以輕鬆方式參與學習。

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㈩臺東縣立圖書館

臺東縣立圖書館針對高齡者提供的服務與活動項目十分多元，特色如下：

1. 在空間上，對年長者的服務措施為就近在入門處設置樂齡閱讀專區，提供報章雜誌、小說、散文、健康、養生等長者可能有興趣的主題館藏，便利借閱。
2. 在館藏上，選書機制會使用流通紀錄分析作為圖書選購的考量。而讀者也可以薦購書籍。
3. 館內服務上，臺東縣立圖書館對年長者提供下列各項活動參與的機會：
   - 「千歲阿媽繪圖樂」活動：社區內行動自如的長者，在週二至週五到圖書館上課，講師教導基礎繪圖技巧，引導使用繪本或工具書，提升創作能力，最後由圖書館將作品集結成冊。
   - 「閱讀臺東」系列講座：以小眾化的講堂模式，邀請台東文史專家與長者建立情感，讓閱聽者體認過往與現今的生活哲學，活絡長者社交。
   - 辦理「英文讀書會」：由長居台東的外籍老師帶領課程，與喜歡讀原文書的長者（如退休教師）講英文、讀原文書，一班約有19位參與者，相當受歡迎。
   - 辦理跨語言說話課：參與者包含志工、老人家、原住民等約40多位，以及親子說故事等藝文活動。透過說對方的語言，認識對方的文化，促進了當地的族群融合。
   - 辦理志工招募：此外，圖書館提供的服務包含「擔任志工」的機會，志工每年招生，年齡層為65至88歲，且屬於生活自如者。年長志工們來圖書館有伴、可以說話，非常開心。老年人來館會利用Wi-Fi與子女道早安（圖書館入口一樓大廳是適合其使用的區域）。而志工激勵方式是達到服勤的標準時數，可參與標竿學習方案。
4. 合作對象與推廣服務上，主要有以下三個合作項目：
   - 與臺東縣社區大學：委託辦理「共筆臺東」，由長輩以口說方式，結合當地文史工作者的寫作能力，共同為後山開墾的過程做紀錄，最後進行成果發表，為長者自己留下精彩的生命紀錄。
   - 與佛教慈濟醫療財團法人關山慈濟醫院：關懷老人進行書目療癒，導讀繪本，激起生命成長的記憶。
   - 與臺東縣中醫師公會：辦理講座或針灸、拔罐、認識中藥材、復健等實作課程。

㈪花蓮縣文化局圖書館

根據訪談資料，花蓮縣文化局圖書館沒有規劃獨立空間的樂齡專區，僅設置有樂齡書籍區，是另一類型的分齡分眾服務。當地年長讀者多半以看報為主要活動。館方同仁表示，花蓮地形狹長，若不向外合作，較難聚集老人家。因此，文化局圖書館與花蓮家庭教育中心合作或與社區發展中心合作，下鄉辦理

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樂齡活動，內容以手作、運動為主。此外，花蓮市另有花蓮市立圖書館，則另置樂齡分館。

㈢國立臺灣圖書館

國立臺灣圖書館（以下簡稱國臺圖）為國家層級的圖書館，位於新北市中和區，腹地廣大，周圍鄰近有公園。亦是國內肩負身心障礙資訊服務的專責機構。針對年長者的服務，國臺圖除了從空間著手改善外，最具特色的部分乃是其對外的合作推廣服務，特別是稚智力量計畫，以下詳述。

1. 改造館內樂齡專區

國臺圖原在二樓設置樂齡資源專區，並依老年讀者可能有興趣的主題，例如：散文、旅遊、健康等議題區分館藏，專區提供體重計、血壓測量器等設備。體認長輩上下樓梯的負擔，2018年底申請空間優化經費，整合一樓長者高使用度的期刊與報紙資源，2019年將專區改在一樓，讓長者就近使用。每週二、四下午，定期辦理影片欣賞及數位課程，參與人數幾近飽和，活動深受歡迎。

2. 與銀髮人力資源中心合作

合作設立專櫃（每週一次駐點服務），提供工作媒合的服務詢問度高，同時也提供個人特質測驗與分析或心理層面的諮詢;定期辦理醫療保健、失智相關講座或與作家有約活動；結合類似臺灣閱讀節等大型活動參與擺攤，與社區資源建立良好互動的成功案例。

3. 與樂齡學習中心合作

提供新北市中和復興國小附設樂齡學習中心，爺爺、奶奶戲劇演出的成果發表舞臺，回饋良好。

4. 兩廳院外展課程

由館內志工協助申請，已合作兩年，有多達10多種課程，課程多元且具深度，如：懷舊治療。課程安排會由受理單位，針對場地及人力進行評估，曾辦理音樂、戲劇等主題課程。

5. 稚智力量計畫

由雙和醫院、新北市失智症協會、及中和八里療養院合作辦理，經費由富邦人壽、菸品捐贊助，計劃內容分為兩部分：

- 輕中度失智症長者，在課程學習後，參與第21個學生的改編繪本，進行話劇演出。
- 邀請專業醫師介紹輕重度失智症的相關症狀。

其中八里療養院部分精神障礙院生，每週會固定到國臺圖協助排架，有助改善病情，是合作互惠的成功案例。八里療養院承辦人回饋，部分社區仍有污名化的狀況，對機構及院生的接受度很低，很開心能跨足社區之外的領域，並感謝國臺圖提供院生成果發表的舞台（謝璿，2018）。

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2021年，國臺圖攜手臺灣失智症協會、失智症相關單位及九個縣市公共圖書館，總共串連24個單位，環島巡迴舉辦「在圖書館遇見德曼莎」講座並在當地圖書館場域中舉辦實體工作坊，邀請失智者及專業醫師與民眾分享失智症相關議題，同時也促進失智者的社會參與，是邁向創建失智友善圖書館與友善學習場所的一大步（國立臺灣圖書館，2021）。

2022年國臺圖與衛福部合作，舉辦長照主題書展「翻轉長照一切照常」，邀請專家學者選出四大領域的相關書單，包括成功老化的準備，預防失智或慢性病的知識與技能，失智照護者的照護經驗分享，給學童讀的繪本童書等。正如衛福部司長所言，最好的長照政策是讓民眾不需要用到長照。這是一種理想，或許不是每一個人都能做到，但圖書館可以運用各種既有資源，包括書刊、雜誌、演講、活動、空間等，促進健康與預防老化，成為延緩長照的重要單位。

㈢國立公共資訊圖書館

國立公共資訊圖書館（簡稱國資圖）是另一個國家層級的圖書館，以科技應用為主要特色。館內設立有獨立的樂齡專區，該區與成人教育系教師合作，購入書籍以老年生命週期的特定主題編排書架，較為特殊。該區提供有電子閱報機、數位桌遊機、及數位運動體驗機。然而，根據觀察使用率並不高，主因數位桌遊機面板會反射燈光，體驗機擺放位置於走道牆面上，電子閱報機介面按鈕多且需站立閱讀，均不利於長者使用，長者也多不願意於眾目睽睽下使用不熟悉的科技產品。國資圖對外曾推動「數位平板到我家」，提供偏遠鄉鎮圖書館可供出借的平板電腦，增加數位學習機會，減少數位落差。

另一方面，國資圖曾於2018年與國家發展委員會合作推動「數位閱讀到您家」，提供偏遠鄉鎮圖書館平板電腦借用服務，增加民眾數位學習機會，期能減少數位落差。許多偏鄉少子高齡化，但有多少家庭的長者因此而受惠，當時並非此一服務的重點。因著科技發展或流行病如新冠肺炎的限制，同時在政府服務積極推動數位轉型的時代，各種政府的老年福利政策與實施越來越多以電子化的形式，未來公共圖書館需要更關注提升老年資訊素養，以協助真正需要政府資源的年長者能排除數位資訊取用的障礙，獲取政府具體的幫助。

此一案例提醒館方在規劃老年科技服務時，產品的擺放空間、位置及方式，除了考量長者生理的特徵外，更應多考量年長者的心理因素，如何協助克服排斥科技的心理，維持自尊的學習方式，以及安排舒適的使用方式，均值得進一步思考與嘗試。

近年，國資圖在推動老年服務更不餘遺力。除了舉辦各種銀髮族關心的主題講座與書展（樂齡圖書專區）、藝術手作與展覽（樂齡美展），2024年10月成立「銀力繪本花園」，為高齡者提供一個美好舒適的閱讀空間，以繪本共讀，促進世代間的交流與理解，並鼓勵高齡者參與繪本創作，讓閱讀成為樂齡生活的

一部分。若銀力繪本花園以閱讀空間取勝，同年設立的「銀力學苑」，則以科技力、健康力、美感力三大領域為核心，設計相關主題課程和活動，持續辦理樂齡相關講座，使樂齡閱讀推廣不再僅是一次性的活動，而能落實終身學習的實質內涵（國立公共資訊圖書館，2024）。

整體而言，筆者觀察到近幾年隨著台灣高齡化的社會趨勢加速與網路科技的蓬勃發展，公共圖書館興起「主題館」的概念（鄒明怡，2023）。例如：臺中市豐原圖書館（鄒明怡，2023）、高雄市立圖草衙分館（袁庭堯，2023），均以成為該市樂齡典範館著稱。

於2019年10月開創樂齡服務的高市圖草衙分館，以長照主題館定位，與鄰近的小港醫院及育英醫專跨域合作，提供各種健康促進的活動與課程，包括失智症分享會，最重要的是在各種活動與課程中，館員都會搭配小型書展，創造五感具足的閱讀體驗，社區長者反應熱烈並從中受惠（袁庭堯，2023）。

在跨域合作面向上，特別值得一提的創新個案為高市圖中崙分館。中崙分館於2025年配合高雄市政府「銀髮健身俱樂部」計畫，結合運動、閱讀與健康生活，為一專為長輩打造的公費補助體適能課程。「由專業教練帶領，結合圖書資源與社區力量，在安全舒適的空間中輕鬆運動、增強體力、維持健康，也能認識新朋友，讓生活更有樂趣！」（高雄市立圖書館中崙分館，2025）。此計畫優先招收65歲以上且能自行行走、站立的健康或亞健康長者，以優惠價格報名參加一系列在圖書館多功能室進行的健身課程並安排有自主練習時間。

綜觀台灣公共圖書館近年創新的高齡服務與活動設計，公共圖書館作為社會性基礎設施，正在朝向Lenstra（2020）在*Healthy Living at the Library*一書中所倡議的發展：「在圖書館健康生活」將是超高齡社會長者的幸福選擇。

六、跨個案綜合討論

前述就各個圖書館的特色說明描述，本節欲結合文獻資料與研究個案提供之資料，跨個案地從以下六大構面來討論蛻變中的公共圖書館：館舍、館藏、服務、館員、合作推廣、與硬體設施。最後補充台灣公共圖書館高齡服務整體的相關議題。

㈠館舍方面

現代公共圖書館的功能與傳統認知上有很大的改變。近20年，全國圖書館事業發展委員會向教育部爭取全國公共圖書館的空間改造與多元閱讀推廣補助計畫，台灣公共圖書館有了很大的進展。[1]

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[1] 參見98-101圖書館空間改造計畫成果：i 悅讀，https://www.youtube.com/watch?v=QBZsSQv-GIUA&t=4s。

中央政府自2003年開始補助各縣市「空間改造計畫」，而自2015年起，陸續新蓋的縣市總館，展現了多元面貌（如已陸續落成的新北、高雄、台東、屏東、台南、桃園、台中，以及興建中的台北等）。

在分齡分眾的指導原則下，許多公共圖書館均設有獨立的樂齡專區，陳列報紙、期刊、及適合樂齡閱讀的書籍區。根據長者的生理特徵，樂齡區應設在一樓，旁邊並有廁所與飲水機，方便長者使用。值得注意的是，新建設的圖書館在以社區為中心的發展趨勢下，空間設計上更多元，開始對高齡者提供懷舊治療、健康飲食、與老年創作的多功能教室或展演區域。

㈡館藏

教育部近年陸續補助公共圖書館「充實館藏計畫」、「多元閱讀推廣計畫」，鼓勵公共圖書館針對分齡分眾提出閱讀推廣計畫。其中，充實樂齡銀髮族的館藏與服務推廣也是各縣市公共圖書館的業務。

部分公共圖書館，特別是規模較小的鄉鎮圖書館，在館舍上並未設有樂齡專區，但在書架區設有獨立的樂齡書區，陳列挑選過、適合年長者閱讀的書籍，或定期以樂齡主題進行小型的新書展示。

再者，經過多年的公共圖書館輔導團的協助與建議，多數公共圖書館辦理樂齡講座時，會結合相關主題館藏，配合舉辦主題書展，鼓勵借閱，活化館藏。

㈢服務

在館內服務上，除了提供健康、理財、旅遊、文史等多數長者有興趣閱讀的館藏外，定期舉辦懷舊講座、健康與運動講座，提供老年科技素養教學課程，文化藝術課程，手作工作坊、以及方興未艾的益智桌遊等，在國內公共圖書館的服務上均是受長者歡迎的服務。換言之，針對高齡服務，公共圖書館應突破僅以視覺為基礎的閱讀推廣，相對的，五感體驗式的新知學習與創造力的發揮機會，將是未來的發展趨勢。

然而，針對台灣日見增多的失智人口與家屬照顧者等相關人員的需求，可喜之處為已有部分圖書館已開始提供相關服務，但規模與方式尚待擴展與研發，目前並未成為公共圖書館普遍的關注。面對超高齡社會的挑戰，日本在2017年已開始著手制訂失智友善圖書館指引（國家圖書館，2019；超高齢社會と図書館研究會，2017），值得台灣圖書館界同仁更深入的借鏡學習。

㈣館員與志工

高齡者不僅僅是一群需要特別照顧的群體，也是一群可以持續成為社會服務的生產者。公共圖書館的高齡志工，即有最佳的演繹。擔任圖書館的高齡志工，對其本身而言，有許多好處（李珮漪、林珊如，2011）。從成本效益的角度來看，對圖書館而言，更是十分珍貴的人力資源。退休的高齡志工，依其原

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有的職業經驗，可以透過分享經驗，成為年輕人的助力。館員與志工可以成為圖書館的師資來源或主持人，也可以成為社區守望相助的重要成員，可以陪伴獨居長者，也可以共同防災。

㈤硬體設施

除了血壓計，老花眼鏡、放大鏡、擴視機、輪椅，均為公共圖書館為長者常備的儀器設施。然而，根據老人身心特徵而購置的，擺置適合長者起坐的桌椅、閱報桌、燈具尚未普及。日本更貼心的提供「走步小推車」，一如大賣場中的小推車，一方面可協助穩定肌肉流失中的高齡者走步安全，一方面可以裝載從書架上取用或欲借閱的厚重書籍，也值得國內參考。國內走步小推車已可見於2022年底落成的桃園市立新總圖。

本次研究中並無特別觸及圖書館樂齡網站的規劃與設計之議題，然而，科技應用是不可避免的趨勢，也是美國與台灣老年服務指引中的重要一項。這也反映出國內公共圖書館在這一方面的缺口。臺南市圖的樂齡網站在國家圖書館聘任的專家學者輔導之下發展樂齡網站的範式，是目前較具雛形功能較佳的樂齡網。圖書館對高齡者的科技應用服務，在專屬網站設計上仍緩步前進。

另一方面，隨著社會變遷與政府數位轉型政策推動下公共圖書館從以館藏為主的服務轉向使用者導向服務，公共圖書館走向在地化及生活化，並開始引進科技設備以提升服務品質。例如2021年初正式開幕的臺南市圖新總館，設立創客空間，提供縫紉機、3D列印機、皮雕機等設備，推廣創齡服務，提供長者透過各種手腦並用課程，活化大腦激發創意，並有機會與同好連結，不僅可以降低超高齡社會年長者之社會孤立感或退休後欠缺職場成就感而產生的憂鬱傾向，更有健康促進、延緩老化之潛在貢獻。

為協助公共圖書館邁向以科技應用創新服務的發展趨勢，國家圖書館（2020）所出版圖書館創客空間建置與服務指引一書，提供同道於相關實務工作上之參考；教育部於2025年更進一步推動「Big Maker全國公共圖書館科技運用與創新實驗環境建置及服務精進計畫」（教育部全球資訊網，2025）。

然而，硬體設施之外，科技應用的核心為軟體的開發運用。如何永續維運相關硬軟體，除了廠商的協助，仍有賴圖書館專業人員的相關技能的提升與投入主導相關應用的規劃。

㈥合作與推廣議題

在焦點團體的訪談資料中論及各館合作與推廣議題，浮現以下主題與相關提案：

1. 有哪些可能的合作單位？如：文化部經費補助科博館、博物館辦理課程；中正大學高齡研究基地，可提供專業經驗及人力的協助。另外，針對生病無法

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到館的老人，新加坡文物局已經提供機器人代理導覽服務，讓行動障礙者超越空間限制，進行瀏覽與提問。全台普遍設立的樂齡學習中心及巷弄長照站為可能的合作單位。

2. 以農為主的地方或鄉鎮圖書館應如何推廣？如：雲林縣高齡化嚴重、教育水平偏低及且有吸毒文化，推動課程不易，在瞭解在地老年人口特色後，以供餐的誘因，成功吸引民眾參加圖書館辦理之活動。因此，如何掌握在地特色因地制宜提供創新服務，是高齡社會圖書館服務設計與推廣重要的發展方向與研調議題。
3. 如何協助農村不識字或不好閱讀的老人更獨立的生活與使用圖書館？有許多非傳統閱讀的方式，包括：說書（館員或志工面對面），講故事，辦講座（參與者用聽的並可與講師互動），採購有聲書（如：歡樂三國志、布袋戲與歌仔戲），影音資料（懷舊老歌與電影），益智桌遊（實體與線上），踏查走讀（口述歷史、老照片、老故事），或辦理真人書借閱服務。
4. 年長者的人力資源如何發揮？埔里利用在地特色，邀請長者參與紙漿椅製作，不僅讓當地長者聚集於圖書館交流、與講師學習、共同創作、最終完成作品，長者有成就感，對圖書館更有認同感，是一具有紀念價值的活動，也顛覆我們僅為長者提供服務的單向思維，見證前來圖書館的長者不僅是被服務者，也可以是提供服務者。老年人力的再利用是重要的議題，值得圖書館界更深入思考與策劃。
5. 館員如何提升老人學相關知能，以便提供更好更貼心的服務給數位時代高齡社會中的長者？除了薦請中華民國圖書館學會辦理相關的在職訓練課程，國臺圖資深館員也提及，博物館界會開設相關培訓課程，建議圖書館同仁大家可多參加，擴充視野、借鏡國內外經驗，提升專業能力，以便在超高齡社會中提供更優質的老年服務。

㈦當前公共圖書館在高齡族群服務上面臨的其他問題

台灣縣市公共圖書館在高齡服務上也面臨環境問題與高齡人口分布分散的挑戰，特別在鄉鎮層次上。地形若是狹長形，鄉鎮圖書館服務的高齡讀者散居各地，或到圖書館不方便時，圖書館如何因應？再者，隨著高齡人口壽命增長健康狀況下降，越來越多困居家中的長者，失能或失智，圖書館如何將其納入服務？外展活動、網路科技或具備數位設施的行動圖書館等，可以如何協助？都值得圖書館同道進一步思考，同步邁向失智友善、全齡友善的圖書館服務。

七、結　語

高齡社會中的公共圖書館，從創造高齡者生活的價值意義到支援認知症，作為社會性的基礎設施，已成為高齡社會中重要的第三場域（third place）。正

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如社會學家Klinenberg（2018/2021）所描繪的，公共圖書館是高齡者的聚集之地、共同學習之地，是維繫健康之地及共有之地，也是社區居民的安全之地，因為有公園綠地環繞，有警衛守望，也有急救措施。

本研究指出，現代公共圖書館，透過實體建築物本身，以及各種資源的提供，對高齡者而言是資訊中心、是交流中心、是學習中心、也是展演中心。圖書館是資訊中心因為年長者可以前往尋找資訊解決心中的問題，特別是人人關心的健康資訊；是交流中心因為可以參與各種活動，遇見不同生活圈的人，有認知的刺激與社會的互動，可以感覺溫暖的陪伴，不感到被社會孤立，降低常常發生在老年身上的憂鬱、失落、與悲傷感；是學習中心因為可以透過閱讀與聽講，上課與討論，知道如何吃如何動可以延緩失能與失智，提升健康素養與數位素養，能運用科技於年老時協助自己在食衣住行育樂上更加獨立；是展演中心因為健康的長者，也有機會在圖書館擔任志工，運用人生經驗與智慧並發揮所長，對社會持續作出貢獻，或追求年輕時因為種種因素無法追求的興趣，語言、戲劇、音樂、藝術等知識技能，並有機會展示與表演，暨利己也利他。這一切，最重要的是，公共圖書館是對所有人敞開，而且是免費的。對已退休、年紀越來越大，未必有固定收入的長者，甚至獨居的老年人，這是一個他們願意喜歡經常拜訪的地方。作為圖書資訊服務者，我們若能體察他們的需要，支持他們維持獨立自尊的生活所需，促成健康老化的過程，越久越好，我們就在正式到來的超高齡社會中扮演不可或缺的角色。

因此，台灣公共圖書館如何在超高齡社會中發揮現代角色，特別是過去未曾深入思考如何提供不同健康條件或不同處境下的高齡者服務，是全體專業人員須共同推動且有待積極發展的趨勢。本研究之研究結果提出國內具有老年服務創新經驗之案例與老年服務相關議題，期能對台灣公共圖書館老年服務規劃提供可行的參考起點與未來相關研究之思考。

致謝與聲明

少數個案內容初稿最早出現於作者受邀主持之研究計畫報告臺灣老年讀者服務指引。在本文撰寫過程中，作者為了長摘要之英文翻譯需求，而使用ChatGPT4o。使用之後，作者已進行審視並編修且對此發表之內容擔負起全部責任。

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Research Article

Exploring Research Trends in Chinese Indonesians: A Bibliometric Study Utilizing the Scopus Database

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Abstract

Studies on Chinese Indonesians have experienced rapid development in the past decade, reflected in the increasing number of scholarly publications. However, the majority are still based on qualitative approaches and case studies. Another fact is that Indonesia has the largest Chinese diaspora in the world. Bibliometrics was used to analyze 496 Scopus indexed documents (2014-2025) with the help of OpenRefine, VOSviewer, and Bibliometrix. The research results show that the research landscape connecting Chinese Indonesians and the Asian region is integrated and multidimensional. Five main thematic clusters cover political-economic relations, social identity, regional collaboration, biomedical genetics, and cultural anthropology. Publications increased from 2017 to 2023. This surge was fueled by the Basuki Tjahaja Purnama blasphemy case and research collaboration during the COVID-19 pandemic, which expanded the use of digital technology and online platforms. This trend is reflected in the increase in contributions to journals such as Sustainability, PLOS ONE, Asian Ethnicity, and Wacana, strengthening the position of interdisciplinary research globally. Indonesia dominates in publication productivity, supported by leading universities such as Universitas Indonesia and Universitas Gadjah Mada, and active collaborations with China, Singapore, and Australia. Among the most prominent authors are Zhang H., Sun Y., and Wang Y., who consistently emerge as key contributors and central to collaborations. Social sciences dominated (28.4%), followed by medicine (12.5%), reflecting an interdisciplinary orientation. Future studies should integrate databases such as Web of Science or Dimensions with a content analysis approach to uncover theoretical connections and emerging themes.

Keywords: *Bibliometric analysis, Chinese Indonesians, Research trends, Scopus database*

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Introduction

The study of Chinese Indonesians has attracted significant attention in academic literature, particularly in the last decade. The study of Chinese Indonesians has attracted significant attention in academic literature, particularly in the last decade. Furthermore, in 2023, Indonesia was recorded as the country with the largest Chinese diaspora in the world (outside of China), with a total of 11.15 million people (Textor, 2024), equivalent to 4% of the total population. This fact has attracted researchers to study Chinese Indonesians and publish in various international journals, particularly those indexed by Scopus. An analysis of Scopus-indexed scholarly publications reveals a growing interest in issues related to ethnic identity, citizenship, social integration, and the political history of this community. Researchers highlight the complex social position of Chinese Indonesians as a minority group with a long history of facing marginalization, prejudice, and state policies of assimilation and discrimination (de Archellie et al., 2025; Harjatanaya & Hoon, 2020; Jailani et al., 2025; Maiddin & Ramle, 2024).

Contemporary trends in the literature highlight the importance of interdisciplinary understanding in studying Chinese Indonesians, including post-colonial approaches, ethnic studies, and citizenship studies. Issues such as ethnicity, hybrid identities, and national loyalties have become key themes widely discussed, particularly in the context of Indonesia's political history from post-independence to post-1998 reform (Chong & Jenne, 2023; Heidhues, 2017; Sidi, 2020). Furthermore, contemporary dynamics such as the role of the younger generation of Chinese Indonesians in education, the economy, and the public sphere are also beginning to receive attention, reflecting the transformation of their identity and participation in modern Indonesian society.

As issues of diversity and social inclusion become increasingly relevant in global and national discourse (Adapa & Yarram, 2022), studies on Chinese Indonesians published in reputable international journals are increasingly enriching our understanding of the dynamics of citizenship and ethnic relations in Indonesia. This demonstrates that this topic is not only important in a national context but also has global relevance in the study of ethnic minorities and social pluralism. In this context, scholarly publications on Chinese Indonesians demonstrate a diversity of approaches, ranging from history and anthropology to sociology, education, and postcolonial studies (Arifin et al., 2017; Joseph & Matthews, 2014; Meyer & Waskitho, 2021; Setijadi, 2016; Xie & Ma, 2023).

Studies on Chinese Indonesians still largely rely on qualitative approaches or case studies. This results in a lack of comprehensive understanding of the key actors in knowledge production, institutional networks, and thematic evolution within these studies over time. Meanwhile, bibliometric analysis is an effective

tool for gaining insight into the evolution of a discipline (Donthu et al., 2021; Ninh et al., 2025; Pessin et al., 2022; Youngblood & Lahti, 2018). This approach allows researchers to evaluate the development of publications in a particular field, identify intellectual trends, and map the actors and institutions that play a crucial role in the dissemination of scientific knowledge (Agostini et al., 2020; Hussain et al., 2024; Karakose et al., 2022; Yan & Zhiping, 2023).

Bibliometrics were used to analyze 496 Scopus-indexed documents from 2014-2025 using VOSviewer, OpenRefine, and Bibliometrix. This study examines trends, patterns, key themes, influential authors and journals, and contributing affiliations. This approach was undertaken to address the knowledge gap regarding how and to what extent this topic has developed in global and national academic discourse, as well as to identify future research opportunities. Specifically, this study will answer the following research questions:

1. Has there been a significant increase in the number of annual publications discussing Chinese Indonesians from 2014-2025?
2. How many total documents were produced by author and collaboration, affiliation, and country during 2014-2025?
3. How is the map of international collaborations shaping up in the study of Chinese Indonesians?
4. What are the main themes or topics that dominate studies on Chinese Indonesians?
5. How is document production from Source and by Subject Area?

By considering these gaps, this study not only presents a comprehensive overview of the development of Chinese Indonesians literature based on Scopus data, but is also expected to identify research trends, academic collaborations, institutional affiliations, and dominant themes in studies on Chinese Indonesians, so that it can provide an empirical foundation, knowledge mapping and a more structured direction for future research.

Methodology

Bibliometric analysis is used to identify the most influential, impactful, and prominent documents, sources, countries, and authors in a field based on publication volume and citation metrics (Mokhtari et al., 2020; Ülker et al., 2023). This analytical approach also facilitates tracking emerging research trends over time, exploring themes relevant to contemporary issues, and identifying knowledge gaps and future research opportunities (Berniak-Woźny & Szelągowski, 2024; Verma & Gustafsson, 2020). In the context of studies on Chinese Indonesians, this method is particularly useful for understanding

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the intellectual dynamics of knowledge production related to ethnic identity, migration history, discrimination, citizenship, and social integration.

To simplify the bibliometric analysis process, this study adapts the methodology used in previous studies by Z. Wang et al. (2018), Trinidad et al. (2021), Pessin et al. (2022), Passas (2024), and Cordeiro et al. (2024), which consists of several systematic stages. The first stage is data collection. The data source for this study comes from the Scopus database (https://www.scopus.com), widely known for its coverage of highly reputable journals in the social sciences and humanities.

Several keywords were strategically selected to explore publications relevant to the topic of Chinese Indonesians. The search was conducted using an advanced search query focusing on article titles, keywords, and abstracts. The search strategy employed the Boolean operator "OR," with syntax such as: "Chinese Indonesia" OR "Chinese Indonesian" OR "Chinese Indonesians", this process retrieved 2,888 documents. The second step involved filtering the data based on predetermined inclusion and exclusion criteria. The selected articles were limited to the period 2014-2025, resulting in 1,827 documents. Next, the authors limited the document type to articles, reviews, conference papers, and books, obtaining 1,546 documents.

Based on the search results in the Scopus database, several keywords were excluded because they were deemed irrelevant to the topic of Chinese Indonesians. Keywords that appeared with high frequency but were not directly related to the research focus included general terms such as Human (148 times), China (148), and Article (134). In addition, there were also biological and medical terms such as Female, Male, Adult, Controlled Study, and Genetics, which reflect the context of clinical or biomedical research rather than social and cultural studies. Several geographic keywords such as Malaysia (53), Vietnam (32), India (32), Thailand (31), Singapore (27), Philippines (27), Japan (27), and Taiwan (17) were also excluded because they refer to other regions in Asia that are not the focus of studies on ethnic Chinese in Indonesia.

Other terms more relevant to medical and biotechnology studies, such as Polymerase Chain Reaction, Genotype, Single Nucleotide Polymorphism, Genetic Variation, Epidemiology, and Risk Factor, were also excluded because they relate to genetic studies, not ethnicity or identity studies. Other irrelevant keywords included Animals, Nonhuman, Body Mass, Obesity, and Diabetes Mellitus, which indicate a predominance of health research. Several economic terms, such as Economic Development, Investment, Commerce, Foreign Direct Investment, and Export, were also excluded because they do not directly relate to the socio-cultural dimensions of the Chinese Indonesians community. Furthermore, there

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are terms that reflect other ethnic contexts, such as Indian, Japanese (people), Korean (people), Filipino (people), Malay (people), Thai (people), and Caucasian, which are not relevant to the Chinese Indonesians population. Similarly, keywords such as Religion, Islam, Marriage, and Cultural Heritage, despite their conceptual closeness, do not specifically refer to the Chinese Indonesians ethnic group in the context of this study. This keyword exclusion process aims to clarify the research focus, namely limiting the analysis to publications that truly discuss the topic of Chinese Indonesians without being mixed with medical issues, genetics, or the context of other countries in Asia.

Therefore, the remaining keywords that are relevant to Chinese Indonesians in the Scopus database are, Indonesia, Indonesian, Chinese Indonesians, Jakarta, Chinese Indonesians, Java, Javanese (people), Sunda Isles and West Java. The results of this process left 538 documents. The authors focused on documents published in English and final documents, obtaining 496 documents, considering that English generally has a global reach and is more accessible to the international scientific community and final documents are representative and comprehensive. However, resource limitations and the need to maintain consistency in our analysis led us to limit our selection to English-language articles. The exclusion of non-English language articles could potentially impact the generalizability of the findings, and this aspect is explicitly noted as a limitation of the study in the conclusion.

Furthermore, with the help of the software (https://openrefine.org/), the authors tidied up the messy Scopus CSV data into a neat Excel and changed the data type detection to be based on the entire dataset. After that, we corrected the author keywords, this was done because it was possible to find inconsistencies, and then carried out a data cleaning process so that it could be used for VOSviewer. After completing this process, a final set of 496 relevant documents was obtained for further analysis. The next step focused on analysis and visualization of VOSviewer (https://app.vosviewer.com/), and Bibliometrix software (https://www.bibliometrix.org/). Metadata from the 496 selected articles was exported from Scopus, including important information such as article title, year of publication, journal name, number of citations, author names, institutional affiliation, author's country of origin, keywords, funding source (if any), and cited references.

The analysis results of the Bibliometix (RStudio) software on the completeness of metadata indicate that the data quality is generally very good. Most metadata elements have a perfect completeness level with an "Excellent" status, including the Author (AU), Document Type (DT), Keywords (DE), Language (LA), Publication Year (PY), Title (TI), and Total Citation (TC) columns, all of

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which have a missing data percentage of 0.00%. This indicates that the data used is highly accurate and ready for further analysis without worrying about losing important information in the publication's core components. Several other metadata elements were categorized as "Good," including Abstract (AB) with 0.61% missing data, Journal (SO) with 3.04%, Affiliation (C1) and Corresponding Author (RP) with 3.64% each, and DOI (DI) with 5.87%. Despite minor deficiencies in these columns, the data completeness was still very adequate for bibliometric analysis purposes. The only element categorized as "Poor" was Keywords Plus (ID) with a data loss rate of 31.38%, indicating that most documents did not include additional keywords from automatic indexing. Overall, these results illustrate that the analyzed Scopus document metadata is of very good quality, particularly in terms of author identity, title, and publication year, although some improvements are needed in the provision of DOI and Keywords Plus to enhance the comprehensiveness of future analyses.

Table 1 presents the data criteria and a summary of the screening process used in this study. The final step involves data interpretation, which involves reviewing all visualization results and descriptive statistics to explore the deeper meaning of these trends (Hassan & Duarte, 2024; Passas, 2024). The primary focus is on understanding the dynamics of research over the past decade, the involvement of academics from various countries, identifying key actors and primary literature sources, and mapping the central themes that dominate scholarly discourse on Chinese Indonesians. This study acknowledges the limitations of using only one database, Scopus. Consequently, it is possible that some important scientific works not indexed in Scopus were not included in this analysis. Therefore, future research is recommended to combine multiple bibliographic data sources, such as Web of Science (WoS), Dimensions, or Google Scholar, to obtain a more comprehensive coverage of the Chinese Indonesians literary landscape

Table 1 Data Search Criteria

Criteria	Description
Source Database	Scopus (Retrieved on October 5, 2025)
Years	2014-2025
Inclusion Criteria	Article, Review, Book, Conference Paper
Exclusion Criteria	The selected documents are only the final ones, not Articles in press
Search String	TITLE-ABS-KEY ("Chinese Indonesia") OR TITLE-ABS-KEY ("Chinese Indonesian") OR TITLE-ABS-KEY ("Chinese Indonesians")
Documents Total	496
Language	English

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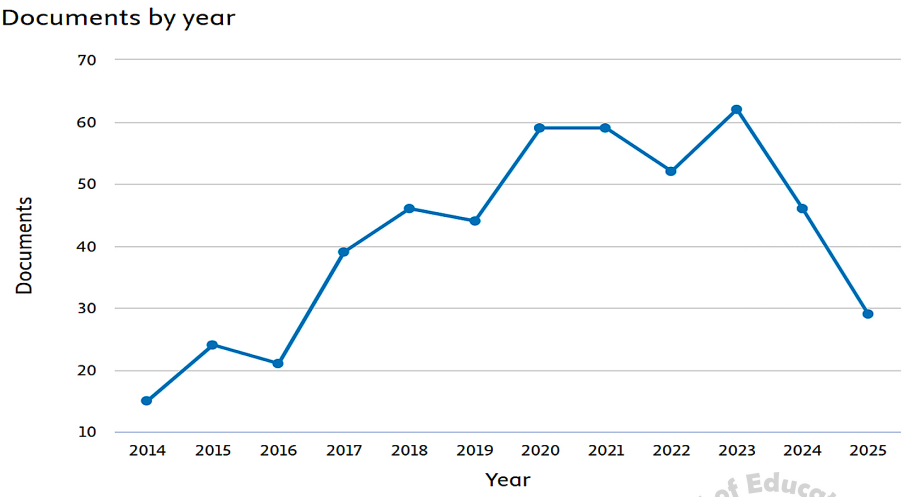
Results

Annual Growth of Publications on Chinese Indonesians

Based on data obtained from the Scopus database, the Documents by Year chart shows the development of the number of publications from 2014 to 2025 (See Figure 1). In general, the publication trend shows a consistent upward pattern until 2023, then decreases in the last two years. In 2014, the number of documents recorded was still relatively low, at around 15 publications. However, in the period 2015 to 2018, the number of publications showed a significant increase—from around 24 documents in 2015 to 46 documents in 2018. This increase reflects the increase in research activity and academic involvement in scientific publications during that period. Publication productivity peaked in 2020 and 2021, with approximately 59 documents published in each year. This period marked a highly productive period for research activity, likely influenced by increased research collaboration and the push for publication during the pandemic, which encouraged the use of technology and online platforms. Although there was a slight decline in 2022 to approximately 52 documents, the trend rebounded in 2023, reaching a peak of 62 documents, marking the peak productivity in the past decade.

Figure 1 Documents by Year (2014-2025)



Source: Scopus, retrieved on October 5, 2025.

However, from 2024 to 2025, the graph shows a fairly sharp decline, to approximately 46 documents in 2024 and 29 documents in 2025, respectively. This decline could be caused by two possibilities: first, the incomplete indexing and data input process for Scopus for the current year (2025); and second, changes in research focus or publication priorities that affect the number of scientific outputs. The analysis results indicate that scientific publication activity

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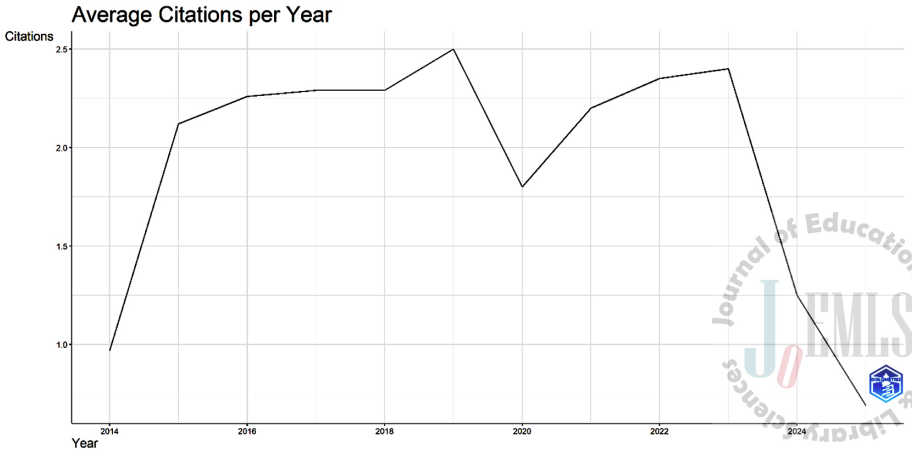
experienced positive and significant developments during the 2014-2023 period. This upward trend indicates the growth of a robust research ecosystem, both in terms of individual productivity and institutional collaboration. The decline in the past two years is believed to be temporary and does not reflect a decline in research quality, but rather is related to the dynamics of the publication system and data updates within the scientific indexing framework.

The Average Citations per Year graph from Bibliometrix illustrates the dynamics of the average number of citations per document over the same period (See Figure 2). The apparent pattern shows fluctuations in the level of publication influence, with a peak trend in the middle of the research period and a sharp decline in the last two years. In 2014, the average citation per article was still around 1 citation per document, but increased significantly to more than two citations per document in 2017-2018. This increase indicates that the works published during that period had high academic relevance and influence. The average citation rate peaked around 2018-2019 at around 2.5 citations per document, before experiencing a sharp decline in 2020. This temporary decline was likely due to a decline in cross-disciplinary citation rates during the pandemic, as well as a delay in the circulation of scientific literature. However, the graph shows a recovery in 2021-2023, with the average citation rate again approaching 2.5 citations per document, indicating a rebound in research impact. The drastic decline in 2024 and 2025, with an average citation rate of less than one per document, is likely influenced by the citation lag effect. Publications published in the last two years have not had enough time to accumulate significant citations. Therefore, the decline is temporary and stems from technical bibliometric factors, not a decline in scientific quality.

Figure 2 Average Citations per Year



Source: Bibliometrix, retrieved on October 13, 2025.

The increase in the number of publications does not always correspond to an increase in citation impact. For example, although the number of documents peaked in 2023, the average citations per document in that year did not reach its highest level. This indicates a balance between research quantity and quality, where productivity growth needs to be balanced with efforts to increase the relevance and credibility of research results. This analysis indicates that the 2017-2019 and 2021-2023 periods saw the best combination of productivity and academic impact, while the decline in the past two years was more temporary and does not reflect a long-term trend. Therefore, these results suggest that the research field under study has a strong research foundation and the potential for continued growth, both in terms of scientific output and academic impact, in the future.

Documents Analysis by Author, Affiliation, and Country

Bibliometric analysis reveals the dynamics of authorship structures and varying collaboration patterns among researchers contributing to this field (See Figure 3 and Figure 4). Based on the Documents by Author results, the distribution of author productivity indicates that only a small proportion of authors have a high publication rate, while the majority contribute a limited number of publications. This pattern illustrates a skewed distribution, where research activity tends to be dominated by a few core authors. Among the most prominent authors are Zhang H., Sun Y., and Wang Y., who consistently emerge as major contributors in terms of both the number of publications and the intensity of collaborations. All three occupy central positions in the research network, indicating a strategic role in the development and dissemination of knowledge on the topic under study. The Collaboration Network visualization reinforces these findings by showing a collaborative structure divided into several thematic clusters. The largest and densest cluster is around authors Zhang H. and Sun Y., who are at the center of collaborations with other authors such as Wang Y., Li C., Chen Y., and Liu J. This cluster reflects an active and interconnected research community, indicating that intensive collaboration occurs around similar themes or disciplines. In addition to this main cluster, there are a number of smaller, relatively independent collaborative groups, such as:[1]

1. The Zhang X. and colleagues cluster (green), which shows weak ties but remains connected to the main network.
2. The Yulianto J.E. and King P. cluster (orange), which indicates local collaboration within an institutional or regional context.

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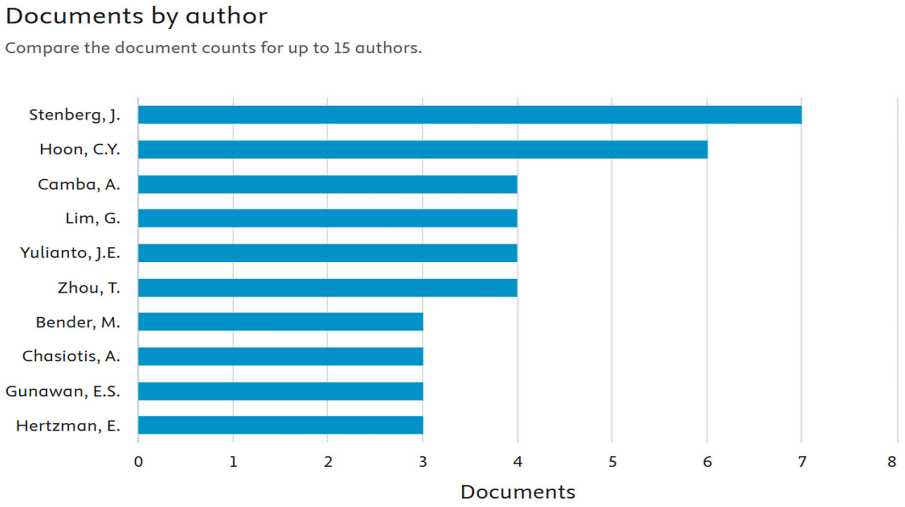
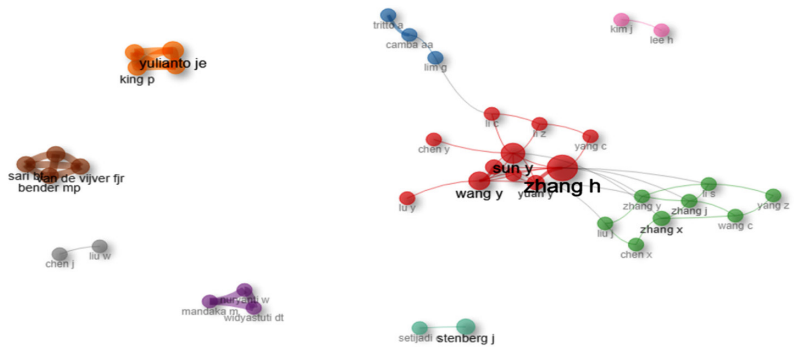
Figure 3 Documents by author (2014-2025)



Source: Scopus, retrieved on October 5, 2025.

Figure 4 Collaboration Network



Source: Bibliometrix, retrieved on October 13, 2025.
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3. The Sari B.A.N., De Vijver F.J.R., and Bender M.P. cluster (brown), which demonstrates a close-knit collaboration pattern.
4. The Nurbayati W., Mandaka M., and Widyastuti D.T. cluster (purple), which indicates small group research activities focused on a specific topic.
5. Bilateral clusters such as Stenberg J. – Setjadi, and Kim J. – Lee H., which depict simple collaboration between individuals.

This collaborative structure indicates that the research ecosystem remains decentralized, dominated by a few lead authors and a number of smaller

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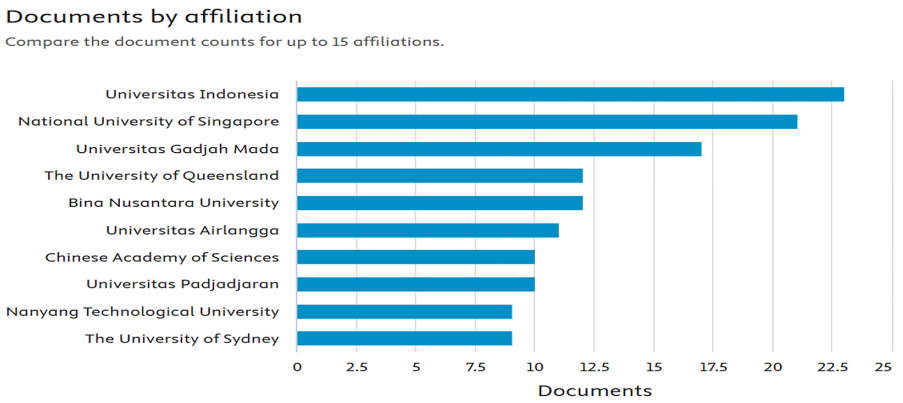
networks operating relatively independently. This pattern reflects a general trend in the global research landscape, where only a small number of authors act as core network hubs connecting various research groups. These bibliometric results indicate that publication activity and scientific collaboration are driven by a handful of core authors, while cross-cluster collaboration remains limited. Strengthening cross-cluster networks, both through international collaboration and multidisciplinary collaboration, could be an important strategy for broadening the impact of future research.

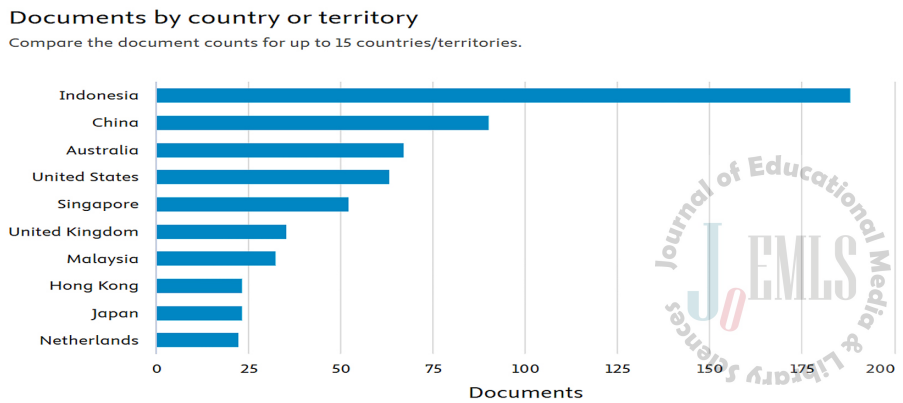
The Documents by Affiliation and Documents by Country or Territory charts demonstrate a strong correlation between centers of scientific production (universities and research institutions) and the geographic constellation of researchers' countries of origin (See Figure 5 and Figure 6). Overall, Indonesia emerged as the leading contributor in terms of publications, with nearly 200

Figure 5 Documents by Affiliation



Source: Scopus, retrieved on October 5, 2025.

Figure 6 Documents by Country or Territory



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Source: Scopus, retrieved on October 5, 2025.

documents, and ranked highest in the country category. This pattern aligns with the data in the Documents by Affiliation chart, which shows three major Indonesian universities—Universitas Indonesia, Universitas Gadjah Mada, and Universitas Airlangga—topping the list for publication productivity. This indicates that national research activity is concentrated in large universities with strong research capacity and active international networks.

Furthermore, the involvement of foreign universities such as the National University of Singapore (NUS), the University of Queensland, the Chinese Academy of Sciences, and the University of Sydney demonstrates the transnational nature of Indonesia's academic collaboration network, particularly with partners from Asia and Australia. The fact that Singapore and Australia also rank in the top five in the Documents by Country or Territory chart further strengthens the evidence of cross-border research connectivity in the Asia-Pacific region. China's second-place ranking in terms of the number of documents at the national level is also reflected in the Chinese Academy of Sciences' contribution to the list of major affiliates. This demonstrates a similar pattern: national research strength is reflected in the dominance of large academic institutions that serve as centers for strategic research and international collaboration. Universities such as Nanyang Technological University (Singapore) and The University of Queensland (Australia) demonstrate that research collaboration occurs not only at the national level but also across geographically close regions with shared academic interests, particularly in the context of Southeast Asia and Oceania. The interrelationship between the two graphs highlights three key points:

1. Indonesia's high research concentration is driven by leading national universities, which play a key role in producing scientific publications.
2. Regional and international collaborations are prominent, particularly with institutions in Singapore, Australia, and China.
3. There is a structural relationship between institutional power and national representation, where the productivity of major universities directly strengthens the country's position in the global research landscape.

In the bibliometric context, affiliation and country of origin of research form a mutually reinforcing research ecosystem, reflecting patterns of collaboration and scientific dominance that are regionally oriented but have global impact.

Visually, Indonesia appears to be a major hub of collaboration, indicated by the dark blue color and numerous connection lines connecting it to various other countries (See Figure 7).[2] The strongest collaborative relationships appear to be

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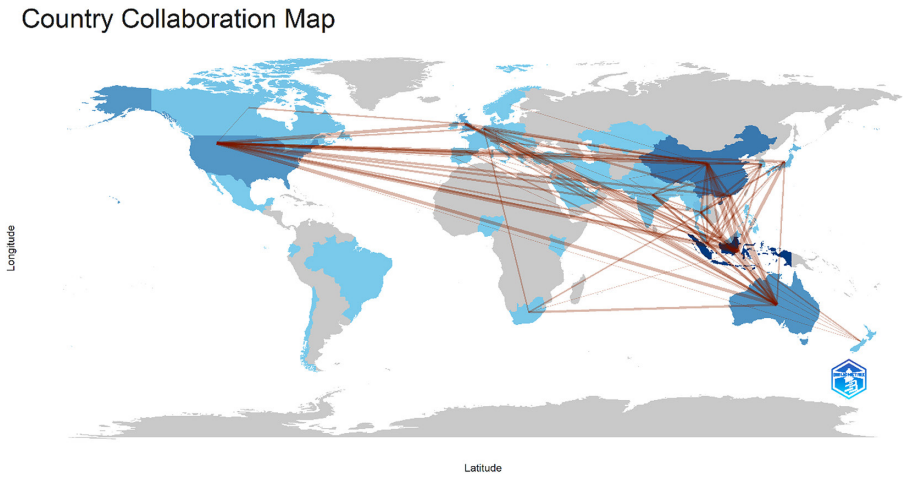
Figure 7 Country Collaboration Map



Source: Bibliometrix, retrieved on October 8, 2025.
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between Indonesia and China, Australia, the United States, and several countries in East and Southeast Asia, such as Singapore, Malaysia, Japan, and Thailand. Furthermore, the active involvement of Western European countries such as the Netherlands, the United Kingdom, and Germany is evident, demonstrating the international reach of research on Chinese Indonesians communities. This apparent pattern of collaboration confirms that the issue of Chinese Indonesians is not only attracting the attention of researchers in Asia but is also a global interest explored through cross-continental collaboration. The dominance of cooperation between Indonesia and China reflects the historical and cultural ties between the two countries, while relations with Western countries demonstrate the academic contributions of international research centers on Asian social, cultural, and political issues. Thus, this map demonstrates that research on Chinese Indonesians thrives within a broad, multinational collaborative ecosystem, combining Asian and global perspectives to understand the dynamics of identity, diaspora, and international relations.

Vosviewer: Visualization of Co-occurrence

The first cluster (red), consisting of 73 keywords, focuses on the dynamics of relations between Indonesia and China in social, economic, and political contexts (See Figure 8).[3] This cluster demonstrates how the interaction between the two countries has become a major focus in various scientific studies, particularly those highlighting the influence of China's foreign policy through the Belt and

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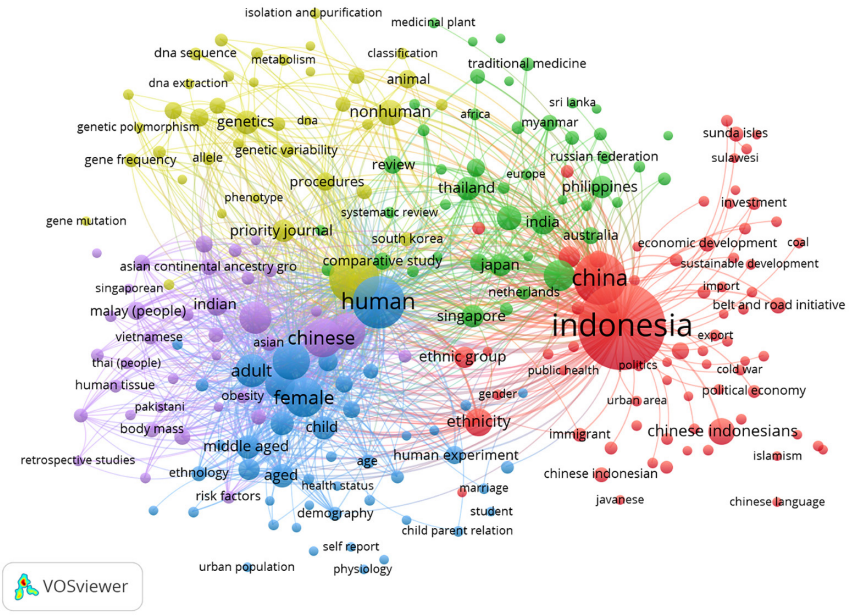
Figure 8 Visualization of Co-occurrence



Source: VOSviewer, retrieved on October 8, 2025.
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Road Initiative (BRI) on economic development in Indonesia. Through a network of keywords such as Indonesia, China, economic development, investment, political economy, and the Belt and Road Initiative, this cluster emphasizes the research orientation on geopolitical and economic issues in the Southeast Asian region. In addition to highlighting macro dimensions such as economic cooperation and infrastructure development, the red cluster also highlights the social and cultural aspects emerging from the relationship between the two countries. This is evident through keywords such as Chinese Indonesians, Islamism, Javanese, and urban areas, which demonstrate the link between global economic policies and social realities and ethnic identities in Indonesia.

The issue of Chinese Indonesians ethnicity is a key component of this cluster, indicating that research focuses not only on economics and politics but also on the processes of social integration and religious dynamics within Indonesia's diverse society. The red cluster represents areas of study that intersect geopolitics, political economy, and the sociology of ethnicity.[4] China's economic influence and foreign policy impact social life in Indonesia, as well

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as how Indonesian society, particularly the Chinese ethnic group, responds to changes occurring in the global and national contexts.

The second cluster, marked in green, consists of 46 keywords and differs from the more geopolitical and economic red cluster, as the green cluster highlights the humanitarian, health, and sociocultural dimensions of Asian societies. This cluster illustrates the trend of research that seeks to understand humans from various dimensions, including biological, social, and cultural dimensions—through a multidisciplinary approach. The themes that emerge in this cluster emphasize the study of population characteristics, social structures, and the dynamics of community life, which include factors of age, gender, ethnicity, and socio-economic conditions.

Dominant keywords such as human, female, aged, middle-aged, child, ethnicity, education, marriage, and students indicate that this cluster focuses on research on human behavior and its social variations. Several other terms, such as socioeconomics, urban population, child-parent relations, and cross-sectional studies, indicate a focus on social and economic environmental factors that influence the lives of individuals and groups. Furthermore, the emergence of keywords such as Chinese, Asian, and ethnology demonstrates the involvement of ethnicity and cultural identity studies, which are an important part of studies in the Southeast Asian region. The green cluster represents areas of interest that emphasize the humanistic and social dimensions of scientific research. This cluster reflects efforts to understand humans not only as biological objects but also as social subjects living within complex cultural contexts and societal structures. Therefore, this cluster shows how research on Indonesia and Asia in general is developing in a broader direction, covering issues of health, education, family, and the ethnic diversity that characterizes societies in this region.

The third cluster is marked in blue and this cluster consists of 46 keywords that describe research fields that focus on the study of the Asian region, especially Southeast Asia, as well as relations between countries in the context of regional social, economic, and political. The main keywords that appear in this cluster include Southeast Asia, Malaysia, Indonesia, China, Thailand, Vietnam, Singapore, Philippines, India, Japan, and Australia. This shows that the main focus of the blue cluster lies in comparative studies between Asian countries, especially in issues related to regional cooperation, economic development, international relations, and socio-cultural dynamics in the region. This cluster's areas of interest include studies on interactions between Asian countries, such as relations between Southeast Asian countries and China, regional economic influence, and geopolitical networks in the Indo-Pacific region. Furthermore, the association of keywords like "United States" and "Asia" indicates that research in

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this cluster also considers global factors, such as the role of major world powers in Southeast Asian dynamics.

The relationship between the blue cluster (Southeast Asian studies) and the red cluster (China–Indonesia) appears very close. The red cluster focuses on issues of identity, economics, and bilateral relations between China and Indonesia, while the blue cluster provides the broader regional context in which these interactions take place. This relationship is evident in the strong connection between the keywords China, Indonesia, and Southeast Asia, which serve as the main connecting nodes. In other words, the blue cluster provides a regional and geopolitical framework for the more specific discussion in the red cluster, namely, the position of Indonesia and China within the social, economic, and cultural networks of Southeast Asia.

The fourth cluster is colored yellow. This cluster consists of 40 keywords describing research fields that focus on scientific and methodological aspects, particularly those related to biotechnology, genetics, and the study of both humans and nonhumans. This cluster shows how scientific knowledge is produced through various research processes, publications, and laboratory experiments involving the study of DNA, genes, and genetic variability. Several dominant keywords such as genetics, polymerase chain reaction, gene frequency, genetic variability, review, and priority journal indicate that the main focus of this cluster lies in the development of scientific methods and approaches that support interdisciplinary research.

In a broader context, the yellow cluster represents research domains that form the basis of biomedical and social studies, particularly in understanding humans as scientific subjects. Areas of interest include genetics, biotechnology, public health, and research methodology. This cluster serves as a hub of scientific activity, producing academic articles and publications, thus playing a vital role in the dissemination of research findings across various fields. The relationship between the yellow cluster and the red cluster, which focuses on China, Indonesia, and Chinese Indonesians, demonstrates an interesting epistemological connection. Connecting points such as “human,” “ethnicity,” and “article” indicate that social and ethnic identity research, including studies of Chinese Indonesians, also relies on an empirical scientific approach. Thus, the yellow cluster serves as a methodological bridge, strengthening sociocultural studies in the red cluster through a strong scientific foundation. This relationship demonstrates that studies of humanity and ethnicity in Indonesia are understood not only from a political and social perspective, but also from a scientific and data-driven approach, reflecting the integration of science and social sciences in understanding the dynamics of humanity and identity.

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Cluster 5, marked in purple and consisting of 37 keywords, indicates a research focus closely related to human studies, particularly in biomedical and demographic contexts. This cluster includes key keywords such as Chinese, male, female, adult, middle-aged, adolescent, as well as various terms related to epidemiological and health studies, such as case-control study, risk factors, and demographics. The main emerging theme highlights research focused on differences in biological, physiological, and genetic characteristics among ethnically diverse human populations, such as Malay, Korean, and Filipino. This cluster reflects strong research interests in medical and population-based areas, particularly in understanding variations in health and disease risk based on age, gender, and ethnicity. The relationship between the purple and red clusters is established through the keyword "Chinese," which acts as a bridge between scientific-biological and socio-political studies. The purple cluster discusses Chinese identity from a biological and demographic perspective, while the red cluster highlights the dynamics of Chinese identity in the context of culture, economics, and international relations. This connection demonstrates that issues concerning Chinese and Indonesian communities are studied multidisciplinary, encompassing medical, social, and geopolitical dimensions. Thus, this network map illustrates how the theme of "Chinese" serves as a meeting point between research on human populations and discussions of identity and cross-border interactions in Southeast Asia.

Sources'Production Over Time and Documents by Subject Area

The Sources' Production over Time chart shows the development of publications from various sources contributing to research throughout the period 2014-2025 (See Figure 9). Overall, there is an increase in the cumulative number of publications in several key journals, indicating increasingly intensive research activity on the topics studied. The Wacana journal recorded a rapid surge in 2017, then tended to stabilize without significant increases thereafter. Meanwhile, the journals Sustainability (Switzerland) and PLOS ONE have shown consistent growth since 2018, with a sharp increase around 2020-2021, reflecting the growing focus on sustainability and multidisciplinary issues. Two conference journals, the IOP Conference Series: Earth and Environmental Science and the Journal of Physics: Conference Series, also show a gradual upward trend, highlighting the role of scientific forums in disseminating environmental and applied science research.

The journal Asian Ethnicity showed significant growth from 2022 to 2023, indicating increased interest in the study of ethnicity and Asian identity within the context of regional research. Thus, the overall pattern indicates that publications on this topic have experienced a progressive diversification of sources and

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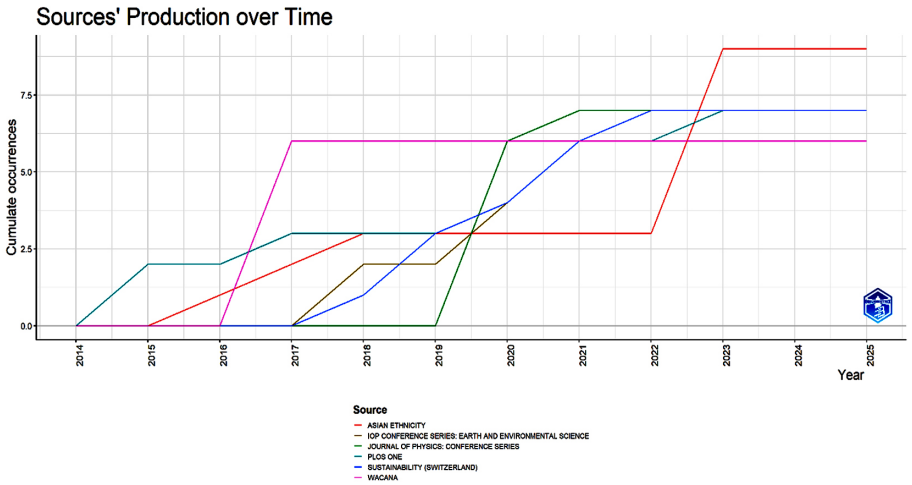
Figure 9 Sources' Production over Time



Source: Bibliometrix, retrieved on October 13, 2025.
Note: This journal is printed in black and white; for color information and color images, please refer to the electronic version.

increased productivity, particularly since 2018. Based on Scopus' Documents by Subject Area data, scientific publications are dominated by the Social Sciences (28.4%), followed by Medicine (12.5%), and Arts and Humanities (10.3%), indicating a strong research orientation toward social, health, and cultural issues. Other fields such as Environmental Sciences (7.0%), Agriculture and Biological Sciences (4.6%), and Economics and Finance (3.7%) also contribute to broadening the scope of research themes. The presence of a significant proportion in the "Other" category (20.5%) indicates the involvement of other disciplines such as engineering, education, and psychology. Overall, this distribution reflects the interdisciplinary nature of the research, with a primary emphasis on the social and humanitarian dimensions while still integrating aspects of science, economics, and technology.

Discussion

Scientific production related to Chinese Indonesians studies in the period 2014-2025 showed a fluctuating pattern with a significant upward trend. In the initial phase of 2014-2016, the number of publications was relatively low and unstable. Entering the period 2017-2021, it experienced a very significant increase, almost doubling the previous year. Two reasons explain this phenomenon: first, in 2017, Indonesia was rocked by racial issues involving then-Jakarta Governor Basuki Tjahaja Purnama (popularly known as Ahok). He was sentenced to two years in prison by a panel of judges at the North Jakarta District Court on May 9, 2017, for blasphemy (Peterson, 2020; Tyson, 2021; Yahya & Susilo, 2024). However, many, including the international community, considered

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the case to be fraught with racial sentiment (Mubah & Anabarja, 2020; Salma, 2025; Wardoyo, 2020). Ahok's position as the first ethnic Chinese and Christian governor in the capital of the country with the world's largest Muslim population further strengthens the perception that ethnic and religious dimensions played a significant role in the case (Hadiz, 2019; Hidayah et al., 2025; Mietzner & Muhtadi, 2018). Furthermore, the momentum of the 20th anniversary of the 1998 Reformation (a major event that also affected Chinese Indonesians) in 2018, along with global trends in Chinese diaspora studies in Southeast Asia, strengthened this study's position in academic discourse. Digital access to archives and historical sources also further facilitated cross-border research.

Second, throughout 2020, the world was hit by the COVID-19 pandemic, which also impacted research trends and research methods themselves (Mishra et al., 2021; Tabish, 2020). This meant that research did not involve direct human interaction and did not require leaving the home or office. As a result, many researchers had ample time to produce papers or at least expedite the writing process using research data obtained before COVID-19. Furthermore, the pandemic is not only understood as a health issue, but also as a social and cultural phenomenon that has significantly impacted studies on ethnicity, particularly the Chinese diaspora community. In the health sector, COVID-19 links research on epidemiology, human behavior, and the global societal response to the outbreak. However, the term's presence is also closely correlated with social issues such as discrimination and stigmatization against ethnic Chinese, who at the start of the pandemic were often negatively associated with the origins of the virus. This phenomenon opens up analytical space for how the global health crisis reinforces ethnic prejudice, while simultaneously triggering new dynamics in discourses about diaspora and intercultural relations.

The research map on Chinese Indonesians also shows an interesting epistemological transformation: from an initial focus on issues of post-reform discrimination and assimilation to a more multidisciplinary approach, placing ethnic Chinese as an integral part of the discourse of nationality and Asian connectivity. This shift is in line with the increasing involvement of Southeast Asian and international academics who see the Chinese Indonesians phenomenon no longer solely within the framework of a minority but as a representation of the dynamics of hybrid identity in the era of globalization. The interconnections between disciplines appear to be growing stronger (Mazzocchi, 2019; Muller & Young, 2014). Social studies and the humanities now interact with disciplines such as health, psychology, and environmental studies. This pattern indicates that the issue of Chinese identity in Indonesia has become a field of interdisciplinary analysis, reflecting the complex relationships between

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culture, economics, and science. This multidimensional approach shifts the study of Chinese Indonesians from the paradigm of a "closed ethnic community" to a perspective of transnational subjectivity, where identity is formed through knowledge exchange, academic mobility, and digital networks.

Despite the increasing number and citations of documents on Chinese Indonesians, English-language publications dominate, particularly in reputable journals indexed by Scopus. This phenomenon is understandable, given that English has become the lingua franca of science, enabling communication across borders (O'Neil, 2018; Suzina, 2021). However, this dominance also creates serious problems, especially for researchers from non-Anglophone countries. Many important research findings addressing local issues, traditional knowledge, or community dynamics struggle to find publication in international journals simply because of language barriers (Collyer, 2018). This results in what is known as epistemic hegemony (Iveković, 2019; Noda, 2020; Vickers, 2020): theories, methodologies, and academic discourse deemed valid are largely determined by Western academic traditions, while local perspectives are often marginalized. This tendency has implications for how Chinese Indonesians discourse is constructed. Issues that garner global attention—such as the diaspora, ethnic relations, and the geopolitics of the Belt and Road Initiative—are more readily accepted by international journals than research that highlights everyday experiences, local traditions, or cultural interactions at the community level. The result is a thematic bias that places Chinese Indonesians studies within the grand narrative of globalization and East Asian economic policies, while local dimensions such as spirituality, regional languages, or minority social relations remain underrepresented.

The five thematic clusters from VOSviewer's analysis demonstrate that studies on Chinese Indonesians are no longer isolated but networked with regional issues. The politics and economics cluster demonstrates the integration of Chinese Indonesians discourse within the geopolitical context and Chinese investment in Southeast Asia. The humanities and culture cluster emphasizes the relevance of historical narratives and identity representations in shaping multicultural awareness. Meanwhile, the biomedical and genetics clusters signal a methodological shift, where ethnic dimensions are understood not only socially but also biologically—a new phenomenon in contemporary Asian research. The trend of cross-border academic collaboration demonstrates that this research is part of the regional knowledge circulation. Dialogues between Indonesia, Malaysia, and Singapore create an academic space that intersects issues of identity, migration, and diaspora. In this context, Chinese Indonesians serve as a "reflective mirror" for Southeast Asian communities in understanding the balance between nationalism, pluralism, and modernity.

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Table 2 Comparative Reflections of Chinese in Indonesia, Malaysia, Thailand and Vietnam

Aspect	Chinese Indonesians	Chinese Malaysians	Thai Chinese	Vietnamese Chinese
Main Focus	Expansion from socio-political and identity studies to health, environment, and biogenetic research; peak publications 2020-2021	Continues emphasis on ethnic politics and affirmative policies; growing inclusion of health, education, and law	Cultural assimilation and urban economy studies; additional works in arts, linguistics, and cultural heritage	Studies link ethnicity with state policies, geopolitics, and economic integration
Identity and Integration	From repression to multidimensional recognition (culture, health, and environmental inclusion)	Citizenship recognition through policy reforms and health/education inclusion	Deep assimilation merging ethnic and national identity	Identity tied to foreign relations and political ideology
Economic & Scientific Role	Trade dominance linked to sustainability, entrepreneurship, and public health; active scientific collaboration with China	Economic participation shaped by redistributive politics and SME innovation	Urban economic participation, tourism, and cultural industries	Trade and production roles conditioned by state control and regional geopolitics
Political and Social Context	Post-reform multicultural inclusion; research diversification post-1998	Ethnic politics institutionalized, influencing education and governance research	Relatively stable; studies emphasize local assimilation and cultural continuity	Shaped by geopolitical tensions (China–Vietnam relations)
Characteristics of Research Output	Strongest interdisciplinary growth (social sciences, medicine, environment, arts); leading regional hub	Balanced output between policy-oriented and empirical research; consistent citation growth	Smaller output but high assimilation focus; emerging arts/humanities research	Politically framed studies dominate; less biomedical inclusion
Dominant Institutions & Collaboration	UI, UGM, Unair, collaboration with Chinese, Australian, and Singaporean universities	UM, USM, UKM, strong China-linked academic networks	Chulalongkorn, Chiang Mai University	Vietnam National University, collaborations with Chinese Academy of Social Sciences
Scientific Dimension	Increasing biomedical, genetic, and environmental studies involving Chinese descent populations	Health disparities, education, and policy evaluation	Minor biomedical engagement	Limited biomedical, more on political and cultural studies
Pandemic Influence (2020-2021)	Surge in publications related to identity, health, and digital transformation	Growth in policy, education, and social resilience research	Cultural continuity and local adaptation studies	Political resilience and China–Vietnam relations under stress

Source: Compiled from Various Sources.

Studies of Chinese communities in Southeast Asia demonstrate an increasingly complex and interdisciplinary development, reflecting the distinct social, political, economic, and scientific dynamics of each country. Indonesia,

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Malaysia, Thailand, and Vietnam display overlapping patterns but also unique characteristics influenced by colonial history, state policies, and geopolitical relations with China. In terms of research focus, there has been a general shift from the study of politics and identity to broader issues such as health, the environment, and biogenetics. This phenomenon is most pronounced in Indonesia, which has seen an expansion from post-New Order studies on discrimination and identity to interdisciplinary research encompassing public health, environmental sustainability, and scientific collaboration with China. In Malaysia, research remains strongly focused on ethnic politics and affirmative action policies, but has begun to integrate dimensions of education, law, and health (Lee, 2023). Thailand exhibits a more cultural orientation, focusing on assimilation, urban economics, and cultural heritage (Teng & Bui, 2020), while Vietnam focuses more on the relationship between ethnicity, state policy, and regional geopolitics, particularly in the context of China–Vietnam relations (Barabantseva, 2015).

An identity and integration perspective, Indonesia exhibits a fascinating transformation process—from repression to multidimensional recognition encompassing cultural, health, and environmental aspects. In Malaysia, Chinese integration is institutionally regulated through policy reforms and citizenship recognition, albeit within the confines of the Bumiputera political system (Koh, 2015). In contrast, Thailand exhibits a very high level of assimilation, with ethnic identities almost completely fused into the Thai national identity (L.-J. Wang, 2018). Vietnam exhibits a different pattern: Chinese identity is more often linked to political ideology and foreign policy, reflecting the context of a socialist state and its fluctuating bilateral relations with China (Thayer, 2017). From an economic and scientific perspective, all four countries demonstrate the active involvement of Chinese communities in urban economies and trade, but within different frameworks. In Indonesia, the Chinese economy is increasingly linked to issues of sustainability, social entrepreneurship, and cross-border scientific collaboration. Malaysia places it within the context of redistribution politics and innovation within Micro, Small, and Medium Enterprises. Meanwhile, in Thailand, economic contributions are more closely tied to tourism and the creative industries, and in Vietnam, Chinese economic activity is often influenced by state policies and regional geopolitical dynamics.

In terms of the impact of the COVID-19 pandemic, all four countries saw a surge in publications in 2020-2021. In Indonesia, the pandemic triggered increased research on identity, health, and digital transformation. Malaysia focused on social resilience and education policy, Thailand emphasized local cultural continuity, and Vietnam highlighted political resilience and foreign

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relations amid geopolitical tensions. The four countries reflect different historical trajectories and ethnic policies, but share a common pattern of knowledge globalization and academic integration with China. Indonesia has emerged as a regional research hub with the most interdisciplinary approach, Malaysia has maintained its relevance through ethnic politics and affirmative action policies, Thailand has demonstrated steady cultural assimilation, and Vietnam remains a unique case where Chinese ethnicity has been consistently linked to foreign policy and state ideology.

Beyond language and themes, the analysis also uncovers institutional gaps. Highly indexed publications tend to originate from large universities with access to international research networks and global funding. Conversely, regional or smaller institutions face limited research infrastructure and publication incentives. This imbalance reinforces the concentration of knowledge production in a handful of elite institutions, resulting in narratives about Chinese Indonesians being written more often from outside the perspective of their own community. These global trends highlight the need for affirmative strategies within the Southeast Asian research ecosystem. Strengthening bilingual publications can bridge the gap between local contexts and global networks, enabling researchers to write in Indonesian without losing opportunities for international visibility. Furthermore, expanding institutional support for universities outside metropolitan centers is crucial to enable them to contribute to global academic discourse. Only then can research on Chinese Indonesians move beyond mere objects of study to epistemic subjects that contribute to defining the direction of contemporary Asian scholarship.

Conclusion and Recommendations

The study of Chinese Indonesians is indeed very special considering interesting facts such as: the largest Chinese diaspora in the world is Indonesia, the richest people in Southeast Asia are Chinese Indonesians, and the long history of relations between Indonesia and China since the 5th century AD which resulted in cultural acculturation between Indonesians and Chinese people. Due to the large number of studies on Chinese Indonesians and the limited capabilities of the authors, this study only examines the years 2014-2025 in the Scopus database. The authors also implemented a strict protocol to ensure the data results are relevant and reflect the actual study of Chinese Indonesians. Overall, the bibliometric mapping reveals an integrated and evolving research landscape connecting Indonesia, China, and the broader Asian region. Five thematic clusters illustrate multidimensional scholarly interactions: the red cluster emphasizes political and economic ties such as the Belt and Road Initiative and Chinese Indonesians identity; the green cluster explores humanitarian and

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demographic aspects related to gender, ethnicity, and social identity; the blue cluster highlights regional collaborations in Southeast and East Asia; the yellow cluster focuses on genetics and biomedical studies; and the purple cluster reflects anthropological engagement with ethnic and cultural diversity. Together, these patterns position Indonesia and China as important hubs bridging political, social, and scholarly research in Asia.

From a productivity perspective, Indonesia leads in terms of the number of publications, supported by major institutions such as Universitas Indonesia, Universitas Gadjah Mada, and Universitas Airlangga. Collaborations with countries like Singapore, Malaysia, and Australia strengthen Southeast Asia's academic connectivity. The dominance of the Social Sciences, along with significant contributions from Medicine and the Arts and Humanities, demonstrates a strong interdisciplinary orientation. A temporal analysis of production sources over time shows a steady increase in academic output from 2014 onwards, with a significant acceleration after 2018. Journals such as Sustainability (Switzerland), PLOS ONE, and Asian Ethnicity show consistent publication growth, reflecting expanding international collaborations and interdisciplinary interests. Meanwhile, the journal Wacana experienced an initial surge, representing a strong initial local platform that laid the foundation for subsequent international visibility. Despite these insights, this study is limited by its reliance solely on Scopus data, which may overlook relevant works indexed in other databases. Furthermore, the bibliometric approach emphasizes quantitative patterns without fully capturing the qualitative depth or contextual impact of the research.

In terms of subject areas, the majority of documents fall within the Social Sciences (28.4%), followed by Medicine (12.5%) and Arts and Humanities (10.3%). This distribution highlights a strong interdisciplinary orientation, with research spanning human behavior, public health, and cultural studies. Significant shares in Environmental Sciences (7.0%) and Agricultural and Biological Sciences (4.6%) demonstrate a growing focus on sustainability and ecological resilience—issues of increasing relevance in regional and global contexts. Recent thematic trends demonstrate an increasingly humanistic research direction, where the focus is no longer on ethnic differences but rather on human experiences and social relations across identities. This approach enriches understanding of how Chinese Indonesians negotiate discourses of nationhood and universal humanity. Thus, research on Chinese Indonesians is not simply a study of ethnicity but also part of an effort to build a more inclusive Asian epistemology that is reflective of global social change. Future studies should integrate multiple databases, such as Web of Science or Dimensions, to improve the comprehensiveness and reliability of the data.

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Incorporating content analysis or citation network approaches is also recommended to uncover deeper theoretical connections and emerging themes. Strengthening international collaborations and diversifying publication outlets will further enhance the global visibility and scientific influence of Asian research networks.

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Research Article

Exploring Related Researchers in Institutional Repositories Based on Machine Learning: A Case Study of Fu Jen Catholic University

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Abstract

This study uses journal articles from Fu Jen Catholic University's institutional repository as a case study to explore researcher relationship analysis methods based on machine learning techniques. Our methods involve extracting features and vectorizing textual data by integrating natural language processing (NLP) techniques, and utilizing three clustering algorithms—hierarchical clustering, K-means, and DBSCAN—for comparative analysis. The results indicate that K-means achieves the best clustering performance. Through title analysis and calculating cluster keywords using the TF-IDF method, K-means effectively groups related articles with minimal irrelevant data and reveals researchers' primary and secondary expertise. Finally, the study visualizes researcher relationships by social network analysis and promotes collaboration and interdisciplinary exchange among researchers. This research enhances the practical value of institutional repositories and provides a concrete implementation framework for researcher relationship analysis.

Keywords: *Institutional repository, Natural language processing, Text clustering, Researcher relationship analysis*

Summary

Introduction

With the rapid advancement of scientific research, interdisciplinary collaboration has become increasingly common, and the boundaries between research fields are gradually diminishing. Conventional academic classification

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systems—such as those used in institutional repositories or university research databases—often rely on administrative divisions such as colleges or departments. However, even within the same department, faculty members may pursue diverse research topics, while researchers from different colleges may share overlapping interests. As a result, traditional disciplinary classification frameworks cannot adequately capture the complexity of modern scholarship or effectively identify potential collaborators.

In response to these challenges, this study examines how machine learning (ML) and natural language processing (NLP) can be utilized to explore potential researcher relationships within institutional repositories. By analyzing Chinese-language journal articles stored in the Fu Jen Catholic University (FJCU) institutional repository, this research proposes a content-driven approach that complements existing administrative classifications and introduces a new framework for understanding academic connections.

Institutional repositories (IRs) play an essential role in archiving and disseminating scholarly work, enhancing visibility, citation impact, and knowledge accessibility. However, their potential for research analytics—such as mapping intellectual structures and identifying collaboration networks—remains underdeveloped. The present study aims to transform IRs from passive storage systems into active knowledge infrastructures that visualize research clusters and relationships.

Main Objective

This research explores how NLP and machine learning can be applied to institutional repository data to identify relationships among researchers based on thematic similarities in their publications. The objectives are threefold:

1. Framework Construction: To develop a computational workflow that preprocesses, vectorizes, and clusters large-scale textual data using NLP and machine learning methods.
2. Algorithmic Evaluation: To compare the effectiveness of three clustering algorithms—Hierarchical Clustering, K-means, and DBSCAN—in grouping thematically related documents.
3. Network Visualization: To construct an interactive visualization of researcher relationships that can support institutional analytics and collaboration discovery.

Through these objectives, the study enhances the analytical value of Fu Jen Catholic University's institutional repository and provides a replicable framework for other institutions seeking data-driven approaches to research mapping and management.

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Methods

Dataset

The dataset comprised 11,143 Chinese-language journal articles authored by 1,101 faculty members of Fu Jen Catholic University, as recorded in its research talent database (as of September 2021). Each record contained basic bibliographic metadata, including author name, department, publication title, and journal source. Because many entries lacked keywords or abstracts, supplementary information was retrieved from public databases, including the "Taiwan Periodical Literature System" and "Airiti Library." After data enrichment, 2,711 records included both abstracts and keywords, 5,412 contained only keywords, 29 contained only abstracts, and 2,991 remained incomplete.

Preprocessing

Data preprocessing involved deduplication, normalization of variant Chinese characters, and tokenization using CkipTagger. Custom dictionaries were created to retain specialized terms and academic expressions (e.g., "葡華字典," "類神經網路") that were often missed by standard segmentation models. Common stop words and filler terms were removed to improve textual clarity. To further enrich semantic representation, each token was mapped to its Wikipedia category labels (updated as of May 2024), thereby expanding conceptual coverage and grouping semantically related terms such as "左傳," "春秋," and "穀梁傳" within the same contextual network.

Feature Representation

Documents were converted into numerical representations using Word2Vec embeddings, trained on a hybrid corpus of Chinese Wikipedia articles and the expanded Fu Jen dataset (titles, abstracts, and keywords). Each term was embedded in a 300-dimensional vector space, and the vector representation of each document was calculated as the mean of its constituent word vectors.

This approach effectively preserved semantic relationships while maintaining interpretability and computational efficiency, making it suitable for large institutional datasets with varied text quality.

Clustering

Three clustering algorithms were evaluated:

1. Hierarchical Clustering: Applied Euclidean distance with a distance threshold of 20, producing 218 clusters comparable to Taiwan's official academic subfield classification (Ministry of Education, 2017).
2. K-means Clustering: The optimal number of clusters (k = 221) was determined using the elbow and silhouette methods to balance cohesion and separation.

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3. DBSCAN: Parameter tuning (ε = 1.05, MinPts = 2) produced 562 clusters but yielded excessive noise and instability, making it less suitable for textual data.

The K-means model achieved the best performance, generating coherent and interpretable clusters that accurately reflected thematic relationships.

Relationship Modeling

Each researcher was represented as a vector indicating the proportional distribution across clusters. The similarity between any two researchers was calculated using cosine similarity.

A web-based visualization system was developed to dynamically display these relationships. Users can search by name, set similarity thresholds, and explore interactive network graphs in which node size represents research volume and edge thickness reflects thematic closeness.

Results

Algorithmic Performance and Thematic Grouping

The comparative analysis revealed substantial differences among the clustering techniques. Hierarchical clustering generated 218 clusters, K-means produced 221, and DBSCAN created 562. The latter exhibited noise-dominant groupings, with 85.9% containing two or fewer entries. In contrast, K-means achieved a balanced distribution and the most semantically coherent groupings, verified through TF–IDF keyword analysis. Table 1 presents the results of the three clustering algorithms.

Table 1 The Comparative Results of the Three Clustering Algorithms

Algorithm	No. of Clusters	Largest Cluster	% of Minimal Clusters
Hierarchical	218	441	9.6
K-means	221	248	12.2
DBSCAN	562	120	85.9

A case analysis using the paper “Forecasting the Singapore Exchange MSCI Index Using Neural Networks and Grey Prediction” confirmed that K-means grouped 91 related articles—most of which dealt with financial modeling, econometrics, and predictive analytics—whereas Hierarchical Clustering grouped only 52. Thematic coherence was validated by shared keywords such as “financial data analysis,” “market trends,” and “technical analysis,” indicating strong alignment between clustering outputs and domain semantics.

Researcher Network Visualization

The resulting researcher similarity network revealed hidden interdisciplinary structures within the university. For the same economics faculty member, 21 related researchers were detected at a similarity threshold of ≥ 0.5. Among

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them, 12 were from the College of Management, 3 from the College of Social Sciences, and 6 from other colleges, including the College of Education and Communication. The closest link (cosine similarity 0.95) involved a scholar in international finance, confirming the model's ability to identify cross-college thematic proximity.

The visualization platform enables users to adjust similarity thresholds and observe how collaboration density changes. These analytics can help users identify the most suitable academic collaborators.

Conclusion

This study applies machine learning and natural language processing to analyze Chinese-language journal articles stored in an institutional repository, aiming to uncover potential academic relationships among researchers. The objective is to help scholars identify prospective collaborators and promote interdisciplinary exchange. While similar in intent to *NTU TOPICs*, this project focuses on institutions that lack access to large-scale databases and rely solely on internal repository data. It demonstrates how comparable analytical outcomes can be achieved under such constraints, offering a practical framework for similar contexts.

Unlike citation-based analyses that depend on complete bibliographic metadata, this study focuses on publication content—titles, abstracts, and keywords—to construct content-based research clusters that transcend traditional departmental boundaries. Visualization techniques were applied to present the researcher's relationships. Experimental results indicate that Hierarchical Clustering and K-means perform best in different scenarios, with K-means showing greater accuracy in discipline-specific clustering. The findings further suggest that dataset characteristics, such as cluster density, influence algorithm performance.

Future directions include adopting soft clustering to reflect researchers' multiple topic affiliations, integrating multilingual datasets to capture global academic activity, and enhancing the web interface to improve usability and feedback evaluation.

Acknowledgment and Declaration

This article is adapted from the master's thesis of the author, Meng-Hsuan Tsai. The contributions of each author are as follows: Meng-Hsuan Tsai: conceptualization, software implementation and analysis, methodology, and drafting of the original manuscript; Shun-Der Chen: conceptualization, methodology, project administration, supervision and validation, and writing—review and editing; Hai-Lun Tu: methodology, validation, and writing—review and editing. During the preparation of this work, the authors used ChatGPT for refine the sentences and the English translation need of abstract. After using

this tool, the authors reviewed and edited the content as needed and take full responsibility for the final content of the publication.

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研究論文

基於機器學習探索機構典藏中關聯研究者—以輔仁大學為例

蔡孟軒[a]　陳舜德[b]　杜海倫[c*]

摘要

本研究探討基於機器學習技術的研究者關聯性分析方法，並以輔仁大學機構典藏中的期刊論文資料為案例，進行研究者間的關聯挖掘與視覺化呈現。研究結合自然語言處理（Natural Language Processing，NLP）技術，對文獻資料進行特徵提取與向量化，並運用三種分群演算法（階層式分群、K-means、DBSCAN）進行比較分析。結果顯示，K-means分群效果最佳，於指定資料群集中透過觀察題名及使用TF-IDF方法計算群集關鍵詞，發現其能在無關資料占比較低的情況下，有效聚集相關文章，並能呈現研究者的主要研究領域與次要專業情形。最終，參考社會網絡分析技術將研究者關聯性以視覺化圖形呈現，進一步促進研究者之間的合作與跨領域交流。本研究不僅提升了機構典藏系統的應用價值，亦為研究者關聯性分析提供了一套具體的實施方案。

關鍵詞：機構典藏，自然語言處理，文本分群，研究者關聯性分析

前　言

隨著科學研究的持續發展，研究者之間跨領域合作變得越來越常見，許多研究領域的界線逐漸模糊。目前常見的學科分類體系，例如本研究中的輔仁大學人才資料庫及其延伸的學術統計網，主要依據學院和學系對研究者進行分類，但即使在同一個學系內的研究者可能就專注於不同的研究方向；或是不同系所之間也可能因研究本質相近而具關聯性。所以傳統以學科別為基礎的分類

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架構，可能無法充分反映學術研究的多樣性、亦難以有效協助研究者尋找潛在合作者。為此，有必要進一步探索新的、更有效的研究者關係架構，以促進跨領域合作與學術交流。

然而，人工重建分類架構是一項龐大的工程，而隨著電腦技術的成長，透過運算技術可望提升此過程的效率。近年來，機器學習（machine learning）的快速發展，為此提供了新的契機。分類（classification）與分群（cluster）技術及其各類相關演算法，可以自動分析大規模的資料，發掘潛在的關聯和模式。若能充分運用機器學習技術，將有助於更全面地理解當前機構內的學術架構，並探索更合理的學科關聯模型。

本研究期望透過機構組織所建構之機構典藏系統，對其典藏的研究者學術成果進行分析，從登載蒐集的著作書目資料進行研究者發表主題分析，並藉由自然語言處理與機器學習相關技術，分析機構典藏庫中研究者間從事研究領域的關聯性，進而建立機構內從事相關或相近領域研究的教師之間的關聯網絡。以發掘潛在合作者，促進機構內不同研究領域教師的交流與合作。

二、文獻探討

㈠機構典藏系統

機構典藏（institutional repository，簡稱IR）是一種長久收集、保存和傳播機構組織的知識研究產出及各項學術成果的儲存庫，包括期刊文章、會議論文、專利、專書、教材等，其成立之主要目的與功能整理有以下五項（項潔、洪筱盈，2005；Covey，2011）：1.完整保存機構內研究歷史、研究重點；2.掌握與評估機構內成員的學術成果；3.促進學術成果的能見度與引用率，更能獲得專業認可；4.確保學術資料的可訪問性；5.學術資料公開性，可增加讀者群、潛在影響，提早傳播研究結果。在Foster與Gibbons（2005）的研究提及研究者對於機構典藏系統的需求，當中包含能與合著者合作、將自己的著作提供給他人、輕鬆訪問他人著作、跟上自身所在領域等。能發現對於研究者來說能輕鬆地找到研究相關領域的著作，或者是讓他人能輕易找到自己的著作是相當重要的事，欲達成這件事首先必須建立一個良好的研究者分類架構。

然而，隨著科學研究的不斷前進，為與他人競爭，跨領域合作已逐漸取代以往個人運作的模式（唐玄輝、林穎謙，2011），在不同研究者間，跨領域合作變得越來越常見，許多研究領域之間的界線逐漸變得模糊。現今機構典藏多使用學科分類體系，如表1節錄自輔仁大學學術統計網的分類架構，主要依據學院與學系對組織研究成果進行分類。然而，於學系層級下，經常涵蓋不同領域之研究者，其研究主題、合作取向亦不盡相同，此架構在促進研究者的關聯性方面有一定的局限，不足以全面反映研究者的潛在的學術連結與合作網路。

也因此現行分類架構可能無法完全反映研究的多樣性、讓研究者找出有利之合作對象，故有必要開展研究，以尋找出新的、更有效的研究者關聯架構。

表1 輔仁大學學術統計網系所分類節錄

學院	學系	學院	學系
文學院	中國文學系	藝術學院	音樂學系
	哲學系		景觀設計學系
	歷史學系		應用美術學系
教育學院	師資培育中心		體感互動設計微學分學程
	教育領導與發展研究所	傳播學院	大眾傳播學研究所
	圖書資訊學系		新聞傳播學系
	體育學系		廣告傳播學系
			影像傳播學系

為找出研究者間的關聯，在社會科學研究中，探索一個社群成員間的關係的方法稱為社會網路分析（Social Network Analysis），可用來分析個人與個人、個人與團體、群體與組織間的關係（Freeman, 2004）。多數大專校院圖書館在建置機構典藏系統時，也會將社會網路的功能納入其中，國立臺灣大學圖書館建立的NTU TOPICs的服務即為其中之一。圖1擷取為該服務網頁畫面，呈現指定研究者與機構中其他研究者的關聯，該服務使用NTU Scholars中教師資訊以及Scopus與Web of Science的資料進行分析，當中教師研究領域是以Web of Science為文章層級分類的Citation Topics為基礎。該分類是依文件引用關係計算，且有專家命名，利用這些資料並以向量空間模型（Vector Space Model，簡稱VSM）計算作者間的研究主題相似度，以社會網路分析之方法將研究者網路視覺化，以促進研究者間的合作與跨領域的推廣（江芊儒等，2022）。

在過去研究中研究者合作網路多數採用共同作者（co-author）或是共被引（co-citation）兩大模式進行分析（Newman, 2001），另外也有像是NTU TOPICs採用大型資料庫所提供的專家知識與分類基準為研究者建立關係，少以從作者所提供的資料內容本身以自然語言處理的角度進行計算，且大型資料庫之資料並非所有機構皆容易取得，因此本研究將以研究者提供之著作資料作為研究來源，評估以研究者提供之著作資料作為研究主題分群的可能性。

㈡自然語言處理技術

自然語言處理（Natural language processing，簡稱NLP）是針對人類的語言文字進行自動化處理的技術，其目標在於讓電腦認識、分析、理解，亦或是合成人類語言，最終達成以自然語言為媒介，使電腦與人類順暢溝通、達成各項任務的目的（曾元顯，無日期）。自然語言處理的技術能協助我們從大量的文獻數據中找到重要的內容，而基本歸納出自然語言處理的主要應用包含（Chowdhary, 2020）：1.索引和搜索大量文本；2.資訊檢索；3.文本分類

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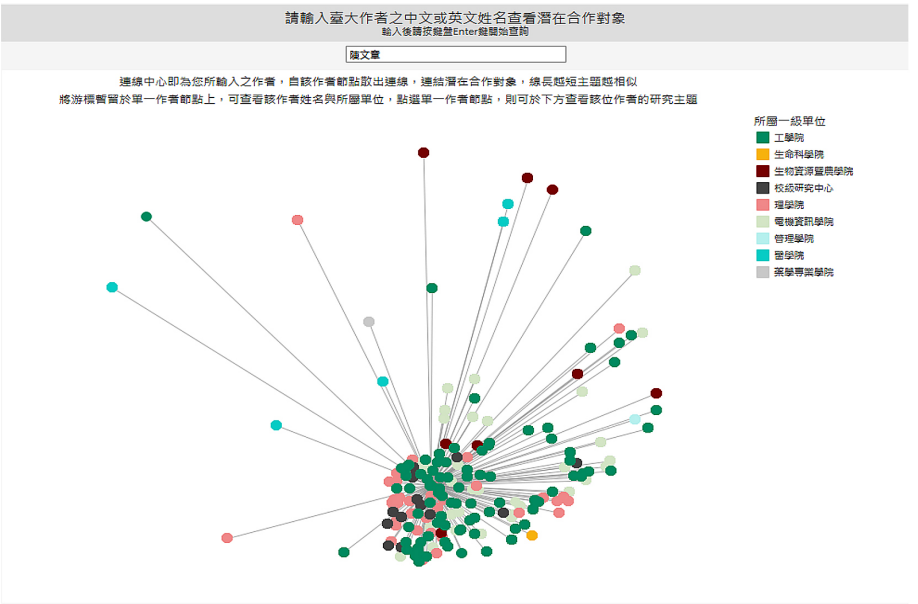
圖1　國立臺灣大學圖書館 NTU TOPICs 服務



說明：本期刊為黑白印刷；本圖所述之色彩資訊及色彩圖像，請參閱電子版。
資料來源：臺大圖書館研究支援組（無日期）。

（document classification 或 text categorization）；4. 訊息提取；5. 機器翻譯；6. 自動文本摘要；7. 問答系統；8. 文本生成。

本研究的主要研究範疇類似於文本分類的文本分群（clustering）。文本分類是一種依照文本的內容主旨為文本給定類別的技術，隨著網際網路及儲存設備的進步，電子資源的數量逐漸龐大，以人工難以妥善管理這些資料，因此文本分類的相關技術也相應增加，如何以自動化的技術，協助大量資料分類，是資訊服務與知識管理的重要課題（曾元顯，2002）。一般而言，分類文本內容的流程包括：對文本資訊進行預處理、抽取文本的特徵並將其向量化、利用特徵向量與分類演算法對問題進行分類處理，最後進行評估（劉卓，2010）。而進行分群的工作亦然，僅是將分類演算法改為分群演算法，來對資料進行重新劃分。

在文本分類的基礎流程中，將特徵詞彙或語句向量化是一個重要步驟，該步驟主要目的是為將文本資料轉為電腦可讀數值，以便後續進行分類計算。將文字或詞句轉換為數值向量的技術有一系列的演進，通常於自然語言中稱為嵌入技術（embedding），早期多以稀疏向量來做為表示，如：One Hot Embedding、詞袋（beg of words）、N-gram 模型，而後衍伸出基於神經網路，用以獲取單詞語意及關係資訊，並以密集向量表示的詞嵌入（word embedding）技術，如：Word2Vec 及 GloVe，後來更衍伸出以句子為主體的技術，如 Transformer 或基於 Transformer 的 BERT、GPT 模型等（Patil et al., 2023）。

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詞嵌入當中Word2Vec技術，是由Google的Tomas Mikolov等（2013）所提出，該研究發現基於神經網路的語言模型明顯優於N-gram模型，Word2Vec中主要使用連續詞袋模型（Continuous Bag-of-Word，簡稱CBOW）和Skip-gram兩大模型作。CBOW的運用方法是在句中挖空部分字詞，利用上下文的來判斷空格中出現字詞的機率，模型中前後文長度則取決於窗口（window）大小，而Skip-gram則相反是利用某一個詞去預測上下文。總體來說Word2Vec的主要概念為「詞的語意是由與其經常共同出現的上下文詞彙所定義」。在訓練Word2Vec需要考量字詞數來決定要訓練的字詞向量維度（vector dimensionary），於Mikolov等人的研究中發現，隨著字詞量及維度上升，可獲得更好的準確性，但在某一點後並無明顯的增長。

近年來以句子為主體進行分析的BERT也廣為應用，BERT（Bidirectional Encoder Representations from Transformers）是由Google團隊Devlin等（2018）提出的一種基於Transformer架構的預訓練語言模型，BERT採用雙向編碼的形式能同時捕捉上下文資訊。理論上於中文文本中可達到以免斷詞的方式進行整體語意特徵提取，於長文本語意、詞序表徵效果較佳。但其所需運算資源較為龐大，加之本研究中語言模型所需要的學科涉獵範圍較為廣泛，多數專業辭彙需依靠更加充足的訓練資源才能得以完善語意，考量到原始資料難以補齊論文關鍵字與摘要等涵蓋資料更廣的欄位，故採用斷詞後以Word2Vec提取向量之方式進行，輔以斷詞字典的調整可保有重要專業辭彙的完整性。

㈢研究主題分析

如前面所提及在過去針對研究者或文獻研究主題相似性的研究中多數採用共同作者（co-author）或是共被引（co-citation）兩大模式進行分析（Newman, 2001），亦或是同Citation Topics採用論文引用關係。而由曾元顯（2011）所開發的Content Analysis Toolkit for Academic Research（簡稱CATAR），則利用書目對（bibliographic coupling）以及共現字（co-word）來對文件的相似度兩兩進行評估，並藉以達成分群，當前有許多研究也利用CATAR進行主題的分析或探索主題的發展現況。

不過無論是Citation Topics所利用的引文關係，或是CATAR分析所需要的資料，皆必須具有完整且詳細的書目資料做為來源才得以達成最好的效果。引用關係與書目對兩種方法，需要完整的參考文獻，而前述所提及的兩個系統皆是利用Web of Science（簡稱WoS）所提供的資料，由WoS提供的資料除了完整記錄所有必要的欄位（如：關鍵詞、摘要、參考文獻等）外，資料也有進行正規化處理或權威控制利於進行分析。較為可惜的是並非大多數機構都有能力取得如同WoS這類大型資料庫所提供的資料，於本研究中使用輔仁大學人才資料庫的資料中並無關鍵詞、摘要、欄位等重要欄位，需於網路上公開資料庫查詢

做補充，在查詢的過程中因資料的年份跨度及誤填問題，部分資料無法查詢到資料或缺少部分欄位，更難以讓所有資料具整齊一致的格式，因此採現有資料訓練Word2Vec模型為每筆資料建立向量，輔以使用機器學習之演算法為文獻進行分群。

㈣ 分群演算法

分群演算法可以藉由分析文章間的關聯性，進一步建立研究者之間關聯，本研究主要比較三種分群演算法，分別為階層式分群（Hierarchical Clustering）、k-means、DBSCAN來進行研究者關聯分析。

階層式分群（Hierarchical Clustering）是透過反覆聚合或分裂，產生一個樹狀結構的分群方法。常見的階層式分類法有：由上而下分裂的分裂分群（divisive clustering），及由下而上聚合的聚合式分群（agglomerative clustering）兩種模式，而聚合式分群較為常見。Murtagh與Contreras（2012）提及許多算法可以實現聚合式分群，包含：單一連結（single-linkage）、完整連結（complete-linkage）、平均連結（average-linkage）、沃德法（Ward method）等。方法間群與群的距離算法不同，而主要參數皆為距離切割線（distance threshold），在指定距離作切割以達成理想的群集數量，可依自身資料形式進行調整。

K-means演算法是相當著名且常被使用的一種分群演算法，其起源可追溯至多位學者在不同時期、不同假設下的研究（Bock, 2007; Sinaga & Yang, 2020）。馬志強等（2007）於其研究中提及K-mean核心概念在於，在原始資料集中隨機選擇k個資料點為初始聚類中心，然後計算其餘資料點與這些中心點的，把資料點歸類給距離最近的聚類中心。接著，根據新的分群結果重新計算各群中心，如此透過重複計算資料點與聚類中心距離的步驟，直到聚類中心穩定不再變動。

由Ester等（1996）所提出的Density-Based Spatial Clustering of Applications with Noise（簡稱DBSCAN）是一種基於密度的分群演算法，其具有密度可達性（density-reachability）與密度連接性（density-connectivity）等特性，可有效發現空間中形狀不規則的聚類，且相較於K-means其執行效率更高。DBSCAN分群演算法主要依賴兩個核心參數：圈選半徑（Epsilon, ε）以及最小點數（MinPts）。演算法執行會隨機一個樣本點作為核心點開始做延伸，計算其半徑範圍內是否大於最小點數MinPts，若點數大於則將其標記為一個群集，以此不斷進行運算，直到遍歷所有樣本點。

三、系統架構

㈠ 研究資料說明

本研究中主要使用天主教輔仁大學研究人才資料庫中，資料標示為「期刊論文」且為中文撰寫之發表著作（收錄截至2021年9月登錄之資料），資料中包

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含1,101位研究者（含括已退休教師）及其在校期間發表11,143篇論文資料。在整理過程中發現有少部分論文資料應屬灰色文獻，有部分專書、會議論文集等實質上並非為期刊論文資料，因研究者在定義認知上差異誤植標示為「期刊論文」，本研究考量此部分錯誤需透過人工篩選的困難性，暫不進行去除。

此外，因原始人才資料庫中的資料缺少關鍵詞與摘要等欄位，本研究透過國家圖書館期刊文獻資訊網之臺灣期刊論文索引系統、Airiti Library華藝線上圖書館進行搜尋來補足缺漏資料。但因資料集年份跨度大，且包含灰色文獻等難以在特定資料庫中取得的文獻，致使經搜尋篩選後仍有部分書目資料缺乏關鍵詞、摘要欄位。表2為經查詢後研究資料取得關鍵詞與摘要資訊狀態。結果顯示，仍有近三千筆資料無法取得關鍵詞、摘要資訊，而大多數資料是屬於有關鍵詞但無摘要的情形。

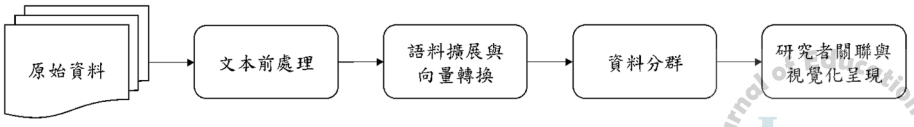
表2　進行資料查補後研究資料包含關鍵詞及摘要狀態

資料狀態	筆數
無關鍵詞與摘要	2,991
有關鍵詞、無摘要	5,412
無關鍵詞、有摘要	29
有關鍵詞與摘要	2,711
總和	11,143

㈡ 系統架構與建置流程

本研究主要流程如圖2所示，將以天主教輔仁大學研究人才資料庫收錄之著作資料做為分析來源。將系統建置流程大致分為四大步驟：1. 文本前處理，將資料做整理與清理以利後續分析，並將斷詞所使用的字典進行基本改善；2. 語料擴展與向量轉換，將詞彙詞意進行擴展並轉成可供計算之數值；3. 資料分群，將資料輸入指定演算法中並評估成效；4. 研究者關聯與視覺化呈現，將最佳成效之分群結果透過網頁方式圖形化呈現研究者關係。將四大步驟進行詳細說明。

圖2　研究主要流程



1. 文本前處理

首先第一個步驟為文本前處理，研究資料採用天主教輔仁大學研究人才資料庫之教研人員個人發表的中文期刊論文資料，進行實際運算前須先將不必要的資訊移除、調整成所需的格式。表3為原始資料的主要欄位、資料概述狀態、以及初步篩選後欄位保留的狀態。研究人才資料庫的資料因年份跨度大、

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多數欄位為研究者自行填寫、且未強制規定填寫格式，有欄位填寫格式不一的情形，因此必須要加以篩選調整格式去蕪存菁，以利後面步驟之進行。

表3　原始資料欄位

欄位名稱	資料概述、狀態	是否保留
教師	教師姓名。	V
教師代碼	教師於輔仁大學中的教職員編號，代表教師的唯一值。	V
所屬單位	教師主要受聘與任教單位，部分資料有空值(未填寫)。	V
學院	所屬單位所屬學院，部分資料有空值(未填寫)情形。	V
狀態	論文狀態為已完成刊登，或期刊已收件正等待期刊出版等。	X
論文篇名	論文名稱，部分資料將期刊名稱重複填於此處。	V
期刊名	論文發表的期刊、論文集，部分資料將其他欄位資料(如：卷號、期別)共同填於此處。	V
作者	由教師自行填寫，論文的作者，可能有共同作者，同一篇文章但不同教師填寫的情況不盡相同。	V
刊登日期	論文出版日期，格式：YYYY-MM-DD。	X
卷號	發表期刊的卷號，部分資料空值(未填寫)情形。	V
期別	發表期刊的期別，部分資料空值(未填寫)情形，或以中文數字表達。	V
頁數	刊載與其勘的頁數，格式不一，頁數連接符號「~」、「-」，前面部分資料加上「頁」字。	V
期刊類型(舊)	發表期刊於哪個資料庫收錄，如：AHCI、THCI、SCI等，部分資料有空值(未填寫)情形。	X
期刊類型(新)	與前者性質相同，同樣是發表期刊收錄的資料庫。	X
論文性質	論文為「學習教育」、「學術」、「實務」中何者。	X
論文屬性	論文為「應用」、「理論」、「其他」中何者。	X
資料建立時間	資料送至資料庫中的時間戳記。	X
備註	對於該論文想增加的描述，可能空值。	X
SDGs	永續發展指標類別，較近幾年才新增欄位，較舊的資料為空值。	X

(1)訓練語料整理

在觀察原始資料時，發現部份研究者存在相同文獻重複填寫的情況，因此，在資料整理整理過程中針對相同研究者且文獻題名相同的資料進行刪除，以確保數據的一致性與準確性。同時也發現部分資料中有HTML特殊字符編碼(HTML character entity)未轉碼之問題，將所有具有此問題的資料進行轉碼，結果如將「煕」轉為「熙」一字。而「熙」字與日常使用的「熙」字略有不同，類似的異體字問題為求精確表達亦一併進行轉換，同時也將所有詞彙統一轉為繁體中文及台灣常用詞彙。

此外原始資料欄位內容較為簡短，無法完整反映其真正含意，致使在進行斷詞後難以抽取足夠的特徵。因此，本研究透過國家圖書館之期刊文獻資訊網與Airiti Library華藝線上圖書館進行自動化網頁爬蟲，來檢索補足人才資料庫研究者所提供文獻書目的關鍵詞與摘要，並新增相關欄位，以增強書目的特徵表現。最終，在11,143筆資料中，仍有2,991筆資料依舊沒有關鍵詞與摘要，有2,711筆資料取得關鍵詞與摘要，5,412筆僅取得關鍵詞，另有29筆僅取得摘要。

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(2)斷詞字典改善

關鍵詞與摘要資料合併後，將針對題名與摘要使用CkipTagger進行斷詞，然而斷詞工具的預設字典有許多新詞彙或專業詞彙並未被收錄，導致這些詞彙被錯誤斷開。為改善此問題，CkipTagger提供自訂建議與強制字典的功能，因此本研究將根據論文關鍵詞、題名與摘要中以書名號、引號等標點符號強調的名詞，以及維基百科條目標題（收錄截至2023年11月21日），並結合字彙長度做為權重，構建建議字典來強化斷詞效果。特別納入標點符號間強調名詞，主要因為觀察到在題名或文章中，常以書名號或引號等方式標示專有名詞、書名或重要詞彙，例如，題名「利瑪竇《葡華字典》中文部分初探」中的「葡華字典」即為特定書名，因此特別擷取此類詞彙納入斷詞建議字典來提升斷詞準確性。

在強制字典的部分，從測試結果顯示，加入建議字典的效果優於強制字典，因此僅在發現仍有不應被斷開之詞被錯誤斷開時，才會使用人工加入。以表4為例，比較有無增加字典的斷詞成效，我們選取研究資料中一篇論文題名進行測試，表格中一到三行分別為原句、未加字典的原始斷詞、加入建議字典斷詞的結果。原先「類神經網路」一詞被斷為「類」、「神經」、「網路」，在加入建議字典後重新合併為完整詞彙，其餘如「新加坡交易所」、「摩根臺指」、「灰預測」等詞也皆被合併。

表4 斷詞結果比較

形式	結果
原句	新加坡交易所摩根臺指現貨開盤指數之預測-類神經網路及灰預測之應用
未加入字典斷詞	新加坡｜交易所｜摩根｜臺指｜現貨｜開盤｜指數｜之｜預測｜類｜神經｜網路｜及｜灰｜預測｜之｜應用
加入建議字典斷詞	新加坡交易所｜摩根臺指｜現貨｜開盤｜指數｜之｜預測｜類神經網路｜及｜灰預測｜之｜應用
停用詞篩選後	新加坡交易所｜摩根臺指｜現貨｜開盤｜指數｜預測｜類神經網路｜灰預測

於字典改善過後針對論文「篇名」與「摘要」兩個欄位進行斷詞，研究中先將停用字（Stop words）進行過濾，包含常見的助詞及高頻詞彙（如：的、之、嗎、吧、如何、這個），以及於論文中經常出現的慣用詞語（如：為例、研究、初探、應用），篩選結果如表4最後一列〝停用詞篩選後〞結果。

2. 語料擴展與向量轉換

在進行分群前需先將文本資料轉換為電腦可讀的數值，可採用稀疏向量、詞或句嵌入等方式。同時為確保語意的正確性，並使電腦能理解相同概念的語彙，例如：「左傳」應與「春秋」、「公羊傳」、「穀梁傳」等語彙相似關聯度較高，其次也與經部的書籍意義上相近，因此要盡可能地擴展相關語料，以提升詞語表達的完整性。

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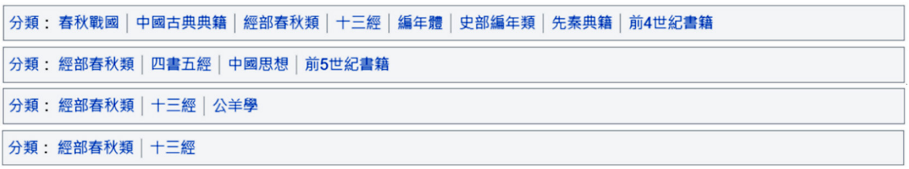
緣此研究中為擴展詞彙關聯的語意表達，採用維基百科頁面分類標籤進行詞語擴展。如圖3所示，從上至下依序呈現「左傳」、「春秋」、「公羊傳」、「穀梁傳」頁面的分類標籤。該頁面分類資料收錄截至2024年5月1日，透過論文篇名、摘要欄位斷詞後的詞語及關鍵詞查詢對應的維基頁面標題，並擷取其分類資訊。最後，將這些分類詞彙新增至資料欄位中作為擴展詞，以記錄各篇文獻所對應的分類擴展詞彙。

圖3　維基百科頁面分類示例



向量轉換的方法，本研究中採用Word2Vec的方式訓練向量模型取得單一詞的向量，訓練資料包含維基百科及研究資料兩個部份。前者資料主以利用中文維基百科的頁面內容（收錄截至2024年5月1日），資料內容為一般進入維基百科詞條的頁面去除文中註解用小標的所有內容，研究中將每一個頁面的內容進行斷詞，並將詞以空格間隔視為一筆訓練資料。後者則將研究資料中「題名斷詞、摘要斷詞、關鍵字、擴展詞」四個欄位橫向合併，詞與詞之間以空格做連接，將各篇文章的四個欄位合併視為一筆訓練資料，方法如表5，該文獻缺乏摘要斷詞的部分，僅將其他有的欄位進行組合，於其他資料遇到欄位缺乏資料的狀況，也是將其忽略合併有資料的欄位。

表5　研究資料部分訓練資料製作範例

欄位	內　容
題名斷詞	新加坡交易所、摩根臺指、現貨、開盤、指數、預測、類神經網路、灰預測
摘要斷詞	-
關鍵字	類神經網路、灰預測、期貨、摩根臺指、ARIMA、Neural networks、Grey forecasting、Futures、MSCI
擴展詞	世界交易所聯盟成員、新加坡公司、新加坡股票交易所上市認股證、E_(數學常數)、基本特殊函式、數字運算、未來、科學方法、金融、金融工程學
訓練資料	新加坡交易所 摩根臺指 現貨 開盤 指數 預測 類神經網路 灰預測 類神經網路 灰預測 期貨 摩根臺指 ARIMA Neural networks Grey forecasting Futures MSCI 世界交易所聯盟成員 新加坡公司 新加坡股票交易所上市認股證 E_(數學常數) 基本特殊函式 數字運算 未來 科學方法 金融 金融工程學

3. 資料分群

本研究進行分群的基準是使用一筆論文資料作為特徵，而不是使用單一詞彙。在利用Word2Vec取得字詞向量後，每個詞彙於本研究中皆為300維的向量，因此可以直接將一篇著作的「題名斷詞、摘要斷詞、關鍵詞、擴展詞欄位

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中每一個詞彙」進行向量相加後取平均值，以獲得一整筆資料的向量，而這個向量同樣是300維。

舉例來說，設D是一篇著作的資料，包括題名斷詞、摘要斷詞、關鍵詞、和擴展詞欄位中的所有詞彙。設詞彙集合為$\{W_1, W_2, \ldots, W_m\}$，其中$m$為該篇文章的詞彙總數。設$V(W_i)=(w_{i1}, w_{i2}, \ldots, w_{i300})$為$W_i$的向量，其中$w_{ij}$表示第$i$個詞彙在第$j$維的值。整篇著作的向量$V(D)$可以表示為：

$$V(D)=\frac{1}{m}\sum_{i=1}^{m}V(W_i) \qquad \text{公式1}$$

而具體來說，對於一篇著作的每一維度j則為：

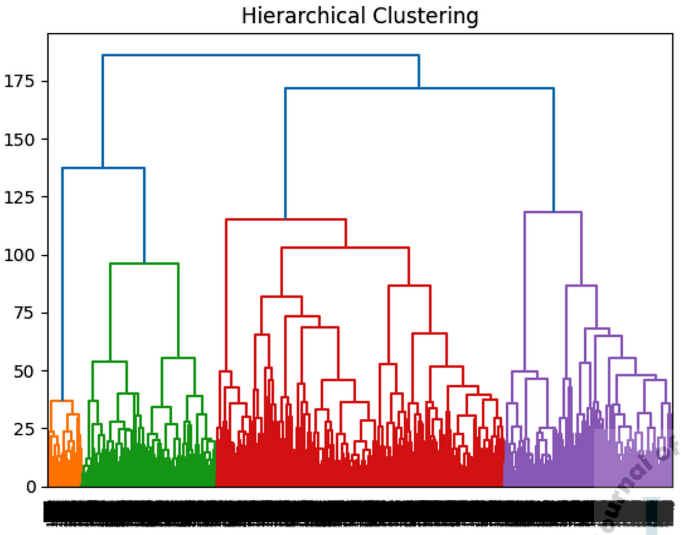
$$V(D)_j=\frac{1}{m}\sum_{i=1}^{m}w_{ij} \qquad \text{公式2}$$

取得向量後則需要為文章進行分群，本研究測試了三種分群演算法，分別是階層式分群、K-means、DBSCAN，以下將針對三項分群演算法的參數設定與運行進行介紹。

(1)階層式分群

階層式分群中採用聚合式分群中的沃德法進行分群，同時合併的群集中心與資料點間的距離使用歐式距離（Euclidean Distance）計算，圖4為使用本次資料進行運算後所得到的樹狀圖。

圖4 階層式分群樹狀圖



說明：本期刊為黑白印刷；本圖所述之色彩資訊及彩色圖像，請參閱電子版。

設定切割距離的決定上參考教育部（2017）修訂之中華民國學科分類標準第5次修正的細學類架構，該標準於2017年參照聯合國教科文組織（United Nations Education Scientific and Cultural Organization，UNESCO）之「國際教育標

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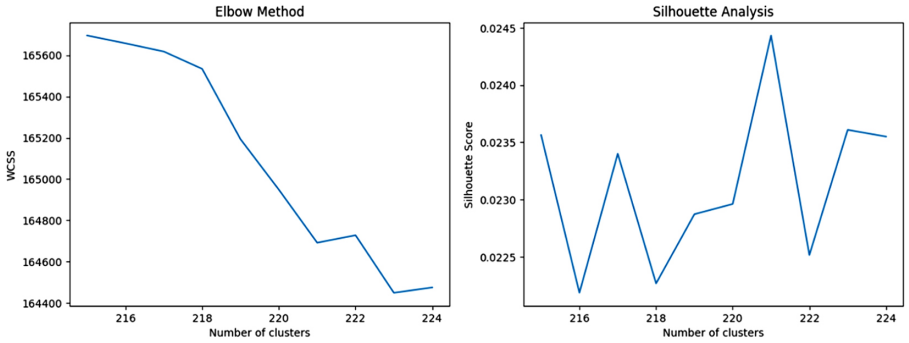
準分類—教育培訓學科，2013」，並以台灣大專校院教育實際情形做修訂。該標準中擁有11大主要領域，當中第11項為其他領域，而輔仁大學的所有科系、所、學位學程，除第8項的農業、林業、漁業及獸醫領域外皆有涉及，而在細學類174項當中屬第8項的僅有12細類，同時在考量編制目的與原則中所提及之各細學類兼具周延與互斥現象，以及各學系除了一個主要細學類外，也可對應數個相關細學類等情形，推測若我們需要考量跨領域研究之情形，需更加細分，應比現行分類標準的174學類更多，經過考量約將群數設定於200至250間，因此於本研究中將階層式分群所需設定的切割距離定於20處，可分為218群。

(2) **K-means**

K-means主要k值之設定參考階層式分群的結果218群，在研究中於215至225的區域間利用手肘法（Elbow method）及輪廓分析法（Silhouette analysis）選定群集。前者是以每一個資料點於所屬資料群集的誤差平方和（sum of the squared errors，SSE）找出明顯轉為平緩的拐點，後者的概念則為同群需越近，不同群需越遠的，所算出來的值須越高越好（Saputra, D. M. et al., 2020）。如圖5所示於研究中在215至225間以手肘法可看出約為221群之後開始回彈下降幅度也減少，輪廓係數法中最高值也同樣於221群時出現，因此於本次研究最終設k值為221。

圖5　K-means測試215至225群之手肘法（左）、輪廓分析法（右）圖形



(3) DBSCAN

DBSCAN中資料點間的距離採用歐式距離進行計算，本研究中嘗試將圈選半徑、最小點數參數進行調整，試圖將群數壓於200至250間，但因於該區間內的結果都不甚理想，資料皆聚集於雜訊群（群編號為 -1），且各群的資料筆數過少，多次嘗試後最終設定圈選半徑為1.05、最小點數為2，於區間外取得相對較好的結果。

在分群實施階段，本研究採用階層式分群、K-means與DBSCAN三種演算法，並依據中華民國學科分類標準作為主要依據調整參數。其中，K-means另輔以手肘法與輪廓分析法，以選定確切的群數。在執行完三種分群演算法後，

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將各自結果進行比較，因文本分群並無標準答案，當前缺乏系統性且客觀的比較方法，相關群集的主題準確度主要依研究者人工檢閱與文獻比對方式進行評估，取出較佳的演算法，並以其結果進行下一步研究者關聯的計算。

4. 研究者關聯與視覺化呈現

進行文章的分群、取得文章的群集後，同時研究者所擁有的研究領域也會藉此產生。因為同一位研究者的文章可能分散在不同群，本研究紀錄研究者所擁有的所有群號，以及在這些群集的篇數，以算出研究者研究群集之比例，製成代表研究者的向量，並計算教師之間的關係。研究者向量製作的範例如下：假設有C1、C2、C3、C4四群，研究者A的文章共有七篇，當中兩篇在C1、五篇在C3，比例的部分四捨五入至小數點第二位，因此研究者A的向量為（0.29, 0, 0.71, 0）。

研究者的關聯程度採取餘弦相似度（Cosine similarity）的方式計算，其可計算向量間的夾角以求得相似程度，其值介於0到1之間，1為完全一致，其公式如公式3，S為研究者的向量，*n*為向量長度。

$$sim(S_1, S_2) = \frac{\sum_{i=1}^{n}(S_{1i} \times S_{2i})}{\sqrt{\sum_{i=1}^{n}(S_{1i})^2} \times \sqrt{\sum_{i=1}^{n}(S_{2i})^2}} \quad \text{公式3}$$

整體算法除了考量研究者是否有交集的群集，亦考量研究者間研究領域的比例是否相近。

四、實驗結果與討論

㈠分群演算法比較

本研究針對階層式分群（Hierarchical Clustering）、K-means 和 DBSCAN 三種分群演算法進行比較，評估其在研究資料中的分群效果。階層式分群以距離20為分割線將資料分為218個群，K-means則設定*k*值為221將資料分為221個群，而 DBSCAN 的參數圈選半徑為1.05、最小點數為2，最終形成562個群。將以指定資料經濟學系陳〇靜老師的「新加坡交易所摩根臺指現貨開盤指數之預測-類神經網路及灰預測之應用」來分析分群情況。

各演算法的分群情形如表6所示，表中最大群資料數與次大群資料數括號內之百分比是占全部11,143筆研究資料中的比例，而DBSCAN的最大、次大群結果為刪除雜訊群後之結果。在分群結果中，階層式分群擁有最高的最大群集資料數，但觀察次大群集資料數，相對來說K-means的兩者落差較小，資料在各群中的分布相對平均。而群集最低資料數DBSCAN因參數設定最小點數為2，所以較其他兩者高，不過屬最低資料數的群集數卻遠高於其他兩者，於該列資料括弧內的百分比為對於總群數之比例，可以發現在DBSCAN中該類資料佔了總群數八成以上，其表現相較其他兩種方法明顯不足。因此，後續的分析主要聚焦於階層式分群與K-means的結果。

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表6　不同分群演算法整體結果比較

分群演算法	階層式分群	K-means	DBSCAN
群集總數	218	221	562
最大群資料數	441（3.9%）	248（2.2%）	120（1.0%）
次大群資料數	292（2.6%）	239（2.1%）	34（0.3%）
群集中最低資料數	1	1	2
屬最低資料數的群集數	21（9.6%）	27（12.2%）	483（85.9%）
指定資料所在群集的資料數	52	91	2

針對階層式分群與K-means進行比較，以指定資料的所屬群集來看，於階層式分群的群集的資料數有52筆，K-means則91筆資料，以該二群集比較與觀察分群演算法的異同。表7為二群相同的資料，兩邊共有11篇相同，有相同篇名的資料於後方以括號註明填寫該資料的研究者，除了指定目標資料外，皆有部分主題明顯不同的文章，如：「爬泳技術分析」，此類問題於兩個演算法的群集中皆有出現，反推其發生原因在於擴展詞彙時的過度擴展的情形，如「爬泳技術分析」該篇文章題名於斷詞時被斷為「爬泳、技術分析」二詞，後者於進行擴展時查詢到「市場趨勢、技術分析、投資策略、股市、金融數據分析」等，類似於該群其他資料數值預測、經濟相關主題的辭彙。除了這類型文章，發現兩演算法皆圈入部分類似於指定資料題名，或相關於經濟、股市指數的文章，可以確認兩分群演算法皆有一定成效。

表7　階層式分群與K-means指定資料所屬群集相同資料

群號（階層式）	群號（K-means）	篇　名
142	61	新加坡交易所摩根臺指現貨開盤指數之預測-類神經網路及灰預測之應用（陳〇靜）
142	61	爬泳技術分析
142	61	蛙泳技術分析
142	61	仰泳技術分析
142	61	MSCI調整臺股指數權重之價格效果
142	61	新加坡交易所摩根臺指現貨開盤指數之預測-灰預測及類神經網路之應用（李〇行）
142	61	類神經網路於現貨開盤指數之預測-以新加坡交易所日經225指數期貨為例（李〇行）
142	61	類神經網路於現貨開盤指數之預測-以新加坡交易所日經225指數期貨為例（邱〇洲）
142	61	兩岸四地消費者信心指數的比較與啟示
142	61	李宗偉與謝龍對戰之技術分析
142	61	2014 BWF世界羽聯年終總決賽男雙冠軍賽技術分析

為驗證分群合理性，本研究也使用TF-IDF分別提取階層式分群與K-means指定群集的前15個關鍵詞來觀察分群情形。表8為兩個指定文章所在群集的關鍵詞，重複關鍵詞包括「金融數據分析」、「市場趨勢」和「技術分析」。然而，從差異的關鍵詞可以發現階層式分群更傾向於聚集研究方法相關的詞彙，如：

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類神經網路、科學方法，這些詞彙可套用於各學科上，而K-means的詞彙則集中於特定學科，且從61群可以發現關鍵詞皆相關於金融市場相當集中。因此我們認為K-means更適合細分特定學科領域，並採用K-means之結果進行研究者關聯計算。

表8 指定群集關鍵詞

分群演算法	群號	篇 名
階層式分群	142	反轉、類神經網路、歐元、指標、指數、財稅差異、不等、金融數據分析、市場趨勢、技術分析、排名、非參數統計、科學方法、未來、預測
K-means	61	流通貨幣、市場營銷、金融工程學、股市、brand、model、消費者、金融、market、商業、投資策略、金融數據分析、市場趨勢、技術分析、市場

㈡研究者關聯網路圖

為探索研究者之間的學術關聯，本研究構建了以網頁為基礎的研究者關聯網路圖，可以透過研究者姓名、教師編號進行研究者關聯網絡查詢，也可以透過調整相似度門檻值（similarity threshold）進行觀察（如圖6）。社會網路圖的呈現會以選定的研究者為中心向外延伸其學術關聯網絡。網頁上方標示所選研究者的姓名、所屬單位，以及所設定的相似度門檻值。以圖6為例，中心研究者姓名旁的數字代表在該門檻值條件下具有關聯的研究者數量，每個節點則是達到相似度門檻值的關聯研究者，圓圈中文字皆呈現該研究者的姓名與其中心研究者的關聯程度。節點之間的連線粗細代表關聯強度，線條越粗表示關聯程度越高。此外，為了強化視覺辨識，本研究於網頁上採用顏色梯度來呈現關聯強度，將門檻值依強度分為四個等級，最強為墨綠、次強為淺綠、較弱為粉紅、最弱為鮮紅。[1]

透過此網路圖，使用者可以直觀地觀察研究者之間的學術關聯，相較於先前提及的NTU TOPICs服務（圖1），除基礎學科種類劃分方式以及相似度計算法的不同外，於系統介面上本系統可根據不同的相似度門檻值調整視圖，以尋找最合適的學術合作對象。

以社會科學院經濟學系陳〇靜老師為例篩選關聯程度0.5以上的關聯研究者，共找到21位相關研究者，其系所人數分布情況如表9所示。此結果中可發現，多數研究者屬於管理學院，共計12位，與中心研究者同為社會科學院的僅有三位。然而，進一步分析所涵括之相關學系發現，經濟學系、企業管理學系、會計學系等，在本校雖分屬不同學院，但在許多其他學校，這些學系通常被歸類於商學院，其研究本質實際上具有高度相似性。此外，表9中粗體標示列顯示，21位研究者中有六位研究者（約28.7%）的所屬學系可能與中心研究者的研究方向有較大差異，但整體而言，該結果符合一般研究者的研究多會與本科系領域較為相似的認知。

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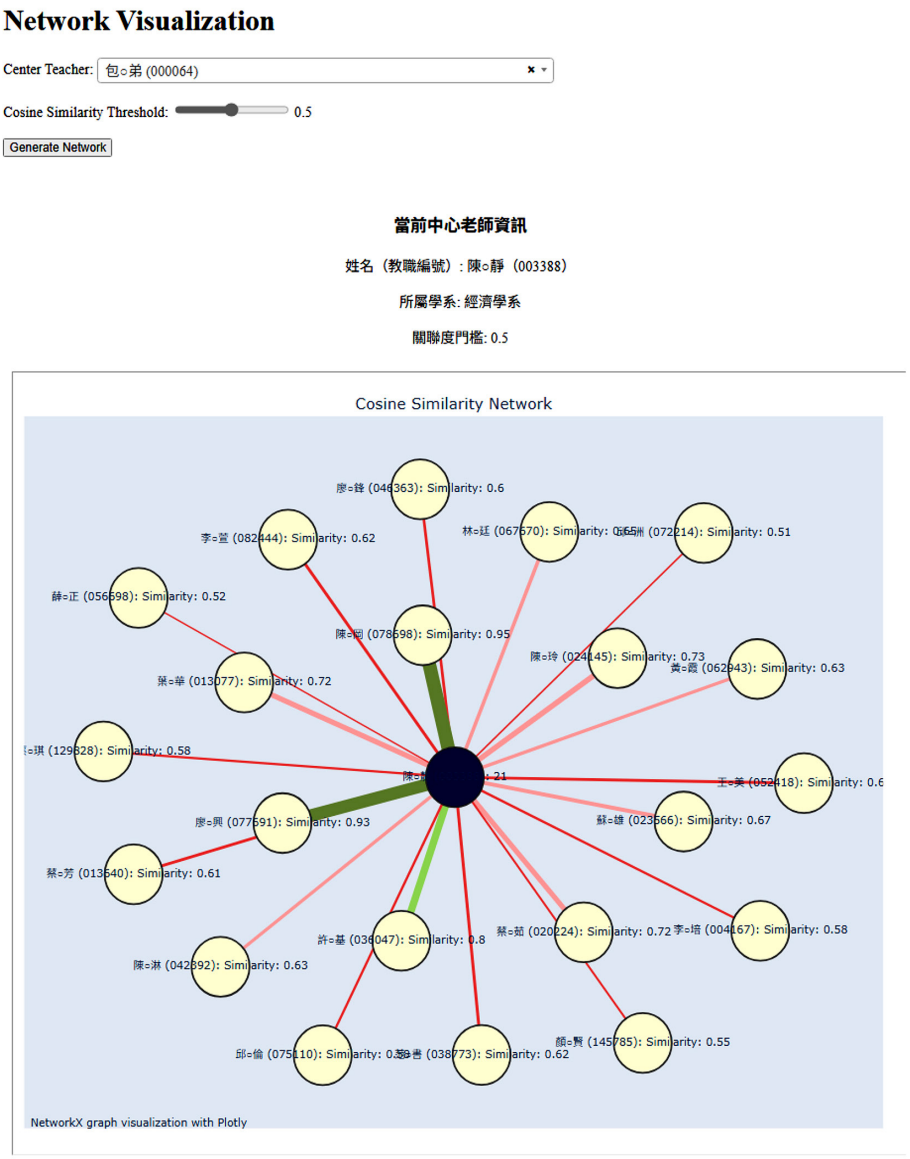
[1] 本期刊為黑白印刷；本圖所述之色彩資訊及彩色圖像，請參閱電子版。

圖6　研究者關聯呈現網頁



說明：本期刊為黑白印刷；本圖所述之色彩資訊及彩色圖像，請參閱電子版。

與陳○靜老師最為相關的研究者為關聯程度0.95的金融與國際企業學系陳○岡老師。比較陳○靜老師與最為相關的研究者的研究內容，陳○靜老師在研究資料中擁有的著作共有四篇，文獻分別所屬群集見表10；陳○岡老師有五篇著作，文獻分別所屬群集見表11。表格中可以看出相關研究者的研究題目有一定的相似程度，同時也可以發現研究群集的相近。

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表 9 陳〇靜老師關聯研究者人數分配
（關聯程度 > 0.5）

學院	所屬單位（學系）	人數（比例）
管理學院	金融與國際企業學系	5 （23.8%）
管理學院	企業管理學系	4 （19.0%）
社會科學院	經濟學系	3 （14.3%）
管理學院	會計學系	3 （14.3%）
未註明學院	未註明學系	3 （14.3%）
教育學院	教育領導與發展研究所	1 （4.8%）
傳播學院	廣告傳播學系	1 （4.8%）
織品服裝學系	織品服裝學系	1 （4.8%）
共計		21（100%）

表 10 經濟學系的陳〇靜老師著作所屬群集

群號	篇 名
61	新加坡交易所摩根臺指現貨開盤指數之預測-類神經網路及灰預測之應用
61	價差與投資策略－以臺灣股票期貨與現貨市場為例
110	影響匯率反轉因素之分析：未預期總體訊息與技術指標
168	戀家特性與實質匯率的半衰期－東北亞三國之實證研究

表 11 金融與國際企業學系陳〇岡老師著作所屬群集

群號	篇 名
61	現金流量基礎之多期信用風險模型--臺灣市場之應用
61	流動性餘額基礎之多期企業短期信用風險模型--臺灣市場之應用
110	交易應收帳款基礎商業本票之多期動態信用增強模型
168	多期企業短期信用風險評估模型
176	支付不能風險對於股票報酬率之影響

先前從表 9 發現與陳〇靜老師相關的學系多與經濟、會計、企管等與管理較為相關的科系，不過當中也有較為特殊科系的研究者出現，如：織品服裝學系的廖〇鋒老師，該研究者共有 36 篇著作於本次研究資料中，表 12 僅列出與陳〇靜老師有交集的文章，但不難看出多數與消費模式等議題有關。雖說兩者的文章可能不完全跟陳〇靜老師預測股票、期貨相關，但在廣義的經濟範疇中擁有一定的關連性存在。由此結果也可得知本研究一定程度上發掘出所屬於不同學系研究者，進行相似研究的情形，並為他們建立關聯。

㈢ 系所跨領域關聯

此外，資料中帶有學院與系所資料，因此也可藉由文獻的分群結果分析系所內之研究領域分布，並與其他系所做關聯的分析，以顯現現今研究跨領域的情形。統計各系所有那些文獻，紀錄所屬群集及各自篇數後，系所之間的關聯同樣採用餘弦相似度進行計算，表 13 以圖書資訊學系為例列出前 10 相關之學系。

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表12　織品服裝學系廖○鋒老師著作所屬群集節錄

群號	篇　名
61	風險降低策略對消費者知覺風險和網路購物意願影響之研究
61	海外代理商激勵誘因與績效關係之研究-以針織機械業為例
61	全球性與地方性快速時尚品牌之價格知覺、流行涉入與品牌權益關係之研究
61	微電影的劇情式廣告是否優於電視廣告 - 與產品的配適效果
61	品牌知名度與稟賦效應對消費者知覺所有權與價格評估的影響
110	從網路外部性與消費者涉入型別觀點探討市場佔有率與消費者品質知覺關係之研究
168	領導型態、情緒智力與員工關係品質及工作投入關係之探討
168	供應商與買方合作關係持續性影響因素之探討--以臺灣紡織成衣業為例
168	探討品牌形象、通路型態與消費特性對品牌權益之影響--以女性內衣為例
168	通路多重特性對消費者知覺與購買意願影響關係之研究
168	消費者的流行焦慮感與獨特性需求對快速時尚品牌知覺品質影響之研究
168	球鞋限量型別與消費者口碑效應關係之研究

表13　圖書資訊學系最為相關10學系

學　系	相似度
心理學系	0.49
商學研究所	0.45
資訊管理學系	0.43
統計資訊學系	0.38
社會學系	0.37
師資培育中心	0.37
公共衛生學系	0.36
教育領導與發展研究所	0.36
室內設計進修學士學位學程	0.34
國際創業與經營管理學位學程碩士在職專班	0.34

首先，觀察最為相關的心理學系，發現兩學系間有20個交集的群集，預先推斷在圖書資訊學系中有資訊尋求行為、資訊需求、使用者行為等探討議題，此些議題為圖書資訊學探討問題之大宗，並皆與人類的心理、行為有關聯，在於觀察詳細資料，發現確實有此現象，表14以其中一交集群集為例，該群集多在探討人的行為因素對於特定事物的影響。

表14　圖書資訊學系與心理學系交集群集資料節錄

學系	篇　名	群集
圖書資訊學系	圖書館知識服務經營現況與潛在客戶需求調查研究	49
圖書資訊學系	圖書館自動化系統轉換實務及對電子圖書館系統之期許	49
圖書資訊學系	政府資訊指引服務	49
心理學系	品牌工作的探索：經理人心智模式之觀點	49
心理學系	組織忠誠的內涵意義、影響因素與行為結果－以臺灣中小企業為例	49
心理學系	供應鏈管理之實驗研究--互依合作關係、系統觀點與供應鏈績效	49

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其次，圖書資訊學系中研究議題的另一大部分是與電腦、資訊科學研究相關，與資訊管理學系具有關聯可顯現此情形，圖資系與其有15個群集交集，當中最為明顯相關的研究主題為系統的資訊檢索、資料探勘的成效評估與使用性評估，表15為其中一交集群。而在教學資源推廣、教學模式成效部分則與師資培育中心、教育領導與發展研究所相關，如表16為三系的交集群集，多在探討教學模式、資源的成效。

表15 圖書資訊學系與資訊管理學系交集群集資料節錄

學系	篇 名	群集
圖書資訊學系	搜尋引擎回覆款目品質探討：以檢索失誤率為例	95
圖書資訊學系	都柏林核心集對減低檢索失誤率的實務研討	95
圖書資訊學系	Google網頁排序能力和回覆款目品質探討：以檢索失誤率為例	95
資訊管理學系	Web-based中文資料探勘系統	95
資訊管理學系	應用資料探勘建構適應型網站	95
資訊管理學系	以資料探勘技術建立宅配業之車輛維修及預警決策支援系統	95

表16 圖書資訊學系、師資培育中心、教育領導與發展研究所交集群集資料節錄

學系	篇 名	群集
圖書資訊學系	大學學生對電子學習歷程平臺之使用反應	26
圖書資訊學系	影響教師創意教學之因素－以綜合活動領域為例	26
圖書資訊學系	線上諮詢式教學對臨床營養課程學習之探討	26
圖書資訊學系	適合網路世代之大學圖書館學習共享空間的設施調查	26
師資培育中心	多元識讀與動畫敘事課程在國語文領域統整中的應用--一個國語文領域統整課程發展之經驗分享	26
師資培育中心	PBL融入師資培育教學實習課程之個案研究	26
教育領導與發展研究所	教育實習輔導制度運用發展性教學輔導系統之策略	26
教育領導與發展研究所	我國大專校院通識教育實施現況調查	26

由此分析可得知本研究可在建立學系的研究主題分布、及建立系所關聯上有一定的成效，可藉由此結果建立跨領域研究分析的網路，以達成協助尋找跨領域合作者的目的。

五、結 論

本研究基於機器學習與自然語言處理技術，藉由機構典藏中研究者登載的中文期刊文獻，探討研究者之間的潛在學術關聯性，以協助研究者發掘潛在合作者並促進跨領域交流。雖與NTU TOPICs在目的本質上是類似的，皆在於尋找潛在合作對象，但並非所有學校皆能有足夠經費取得大型資料庫支持，在僅能依靠學校內固有的機構典藏資料的情況下，這些資料的完整性必不能與大型資料庫的資料相比，也因此我們探討了該情形下可以使用何種方式達到類似的成效，以提供有類似情形的機構作為發展參考。

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研究中所採用的模式與既有主要依賴引文分析的研究不同，引文分析法多賴以參考資料的完整性，因此本研究聚焦於文獻內容，透過題名、摘要與關鍵詞的分析，突破傳統學系單位的分類框架，建構以研究內容為基礎的研究群集，並以視覺化技術來呈現研究者之間的學術關聯性。實驗結果顯示，在所使用的分群演算法中，階層式分群（hierarchical clustering）與 K-means 在不同情境下各具優勢，其中K-means在特定學科的聚類效果上更為顯著，實驗結果較符合期望成果。此外，我們也透過DBSCAN的分群結果發現資料特性，如：群集密度，會對演算法效果存在一定的影響。

基於研究發現，本研究提出以下幾點未來發展建議。首先，演算法的選擇應更充分考量研究資料的特性，例如針對密度不均的群集情況調整適配的分群方法，以提升分群準確性。其次，建議未來研究以研究者為分析核心，整合其相關文獻特徵，並採用軟分群（soft clustering）方法以揭示研究者多元的群集屬性，提升分析靈活性與適用性，同時因分群結果並無標準答案，且資料量較多，以人工難以一一檢視結果，我們也期望能找到系統性、客觀的方法量化評估分群結果驗證。此外，考量現實中研究者多數發表於英語期刊，未來研究可進一步擴展至多語言範疇，納入英文、日文等文獻，全面反映研究者的學術活動，因此如何解決多語言資料整合中的翻譯問題將是一項重要挑戰。於視覺化呈現的網頁方面，當前頁面較為精簡，對於一般使用者來說難以對系統功能一目了然，未來有許多值得精進之處，如：連結延伸呈現教師著作的資訊等等，也期望在精進後，蒐集使用者回饋進行實用性等評估。

致謝與聲明

本文章改寫自作者蔡孟軒的碩士學位論文，每位作者的貢獻如下：蔡孟軒：論文構思、程式實作與分析、研究方法、初稿寫作；陳舜德：論文構思、研究方法、專案管理、監督與驗證、編輯寫作；杜海倫：研究方法、驗證、編輯寫作。在本文撰寫過程中，作者為了梳理文句與摘要之英文翻譯需求而使用ChatGPT。使用此工具之後，作者已根據需要再進行審視與編輯該內容，並對此發表之內容擔負起全部責任。

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附　錄

教育資料與圖書館學 學術出版倫理聲明
Academic and Publishing Ethics Statement of *JoEMLS*

Version 3

教育資料與圖書館學（以下稱本刊）秉持學術規範與同儕評閱精神，重視投稿論文的嚴謹度外，亦重視學術與出版倫理。JoEMLS網站上的所有資訊都遵循學術出版透明度和最佳實踐原則（*Principles of Transparency and Best Practice in Scholarly Publishing*）中的描述指南。

無論中、英文稿件，作者於投稿前即需確認文中主要論述、研究發現與結論建議等，皆有其原創性並符合學術引用規範之要求。投稿至本刊之所有稿件均使用Turnitin系統進行內容相似度比對。本刊所收錄稿件必須滿足未曾於紙本或網路電子形式媒體上之公開發表，且投稿同時需提供保證與授權書，保證論文沒有一稿多投，內容亦絕無涉及任何抄襲型態與侵害他人著作權之情事。研究論文經本刊雙匿名送審且獲接受建議後刊登全文，惟作者仍須對論文正確性與嚴謹性負責。

本刊另將於取得作者、審稿者之同意後，對相關作者回應與同儕評論內容另作揭露。如本刊「投稿須知」所示：本刊作者同意其投稿之文章經本刊收錄後，無償授權本刊以開放取用（Open Access）以及非專屬授權之方式，再授權予其他資料庫業者收錄於各該資料庫中，並得為重製、公開傳輸、授權使用者下載、列印等行為；以及為符合資料庫之需求，並得進行格式之變更。

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3. 給予投稿者適當管道表達意見，並遵循適當處理程序。
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⑶ 於本刊公布其失允之事實。

[1] 相關說明另見邱炯友，「編者言：期刊稿件倫理爭議處理之思考」，教育資料與圖書館學53卷，2期（2016年春季號）：135-138。

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附　錄

生成式AI之自我揭露與誠信原則
Guidelines on Self-Disclosure and Integrity in the Use of Generative AI

（1st ed. 第一版）
教育資料與圖書館學2025年12月6日發布
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隨著大型語言模型（Large Language Models, LLMs）等生成式AI技術的迅速發展，研究者在進行研究、撰寫或翻譯時使用AI工具已日趨普遍。為維護研究透明度與學術誠信，本刊生成式AI之自我揭露與誠信原則（以下簡稱為「*JoEMLS AI*誠信原則」）要求凡於研究或稿件撰寫過程中使用AI工具生成任何內容者，作者皆需於內文適當位置標示引述／引用或另行提供AI使用聲明。通常這些標示可出現於：作者註記（Author Note）、研究方法（Research Method）、致謝（Acknowledgement）、引用文獻（Citation；含內文之圖表註記note），以及附錄（Appendix）等五個標示處。

本刊基於排版與版面考量，避免「作者註記」項目過於繁複，特將AI相關之使用聲明統一移置於文章末尾，並以「致謝與聲明（Acknowledgment and Declaration）」為標題揭露AI工具之使用情形，而此部分屬於本刊必備項目。若AI技術對研究設計、資料處理或方法流程等事項具有實質影響，則務必另於「研究方法」章節中詳加描述與說明。[1]

以下內容包含APA與Chicago Style（含Turabian Manual）引文格式示例，以及「致謝與聲明（Acknowledgment and Declaration）」之文字模板，並加入補充說明以利作者判斷。

一、引文格式範式與範例 Citation Formats and Examples

㈠APA格式

儘管APA格式要求作者將「交談標題」置於參考文獻裡，但是作者仍要注意到：由於作者可能會多次提問AI並做細部修正，若欲完整與準確地呈現作者與AI的互動內容，以供讀者未來研究複製檢驗或延伸探討議題之用，則純粹單靠參考文獻所呈現提問的交談標題仍將難以達到此目的；因此，作者於必要時應在論文本文中多加敘述細節，或另於附錄中表達。

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括號內引用（Parenthetical citation）：
（AI 公司名稱，YYYY）或 (AI Company Name, YYYY)

[1] AI工具之使用日漸多元複雜，因此易產生某些模糊情境。例如，兩種可能無需特別引用或揭露AI使用情境：AI工具已被整合於搜尋引擎之中（視同搜尋引擎之引用規範），或是某常用軟體已兼具AI功能（仍視為該常用軟體之功能）。另外，「附錄」則有利於呈現AI之提問（prompt）層次過程之內容資料。本文件「*JoEMLS* AI誠信原則」2026新修訂版將再詳細規範與分類選項，以便利投稿者依據各類情境進行處理。

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【內文引用範例 In-Text Citation Example】

敘述式引用（Narrative citation）：

例句：根據Anthropic（2025）對於學術期刊出版透明度重要性的詮釋……

或or

According to Google's (2025) interpretation of the types of academic misconduct in scholarly journal publishing, ...

括號內引用（Parenthetical citation）：

例句：生成式AI之學術期刊審查倫理其涵蓋了以下幾點……（OpenAI, 2025）。

或or

The current status of article processing fees charged by scholarly journals involves the following aspects ... (Microsoft, 2025).

【參考文獻範式 Reference Format】[2, 3]

中文：

AI 公司名稱。（YYYY年MM月DD日）。交談標題〔生成式AI交談〕。工具名稱／模型。https://XXXXXXXXX

英文：

AI Company Name. (year, month day). Title of chat [Generative AI chat]. Tool Name/Model. URL of the chat

【參考文獻範例 Reference Example】

Anthropic。（2025年12月2日）。學術期刊出版透明度的重要性〔生成式AI交談〕。Claude Sonnet 4.5。https://claude.ai/share/8a8ed4ba-a16d-4ebb-8830-f1813a17db7c

Google. (2025, December 2). *Types of academic misconduct* [Generative AI chat]. Gemini 3 Pro. https://gemini.google.com/share/d5d63287d55d

Microsoft. (2025, December 2). *Current status of article processing fees charged by scholarly journals* [Generative AI chat]. Copilot. https://copilot.microsoft.com/shares/PqxGuv2Cf6dSfwhBqYjxL

OpenAI。（2025年12月2日）。生成式*AI*之學術期刊審查倫理〔生成式AI交談〕。ChatGPT。https://chatgpt.com/share/692e129d-e0d4-8000-8637-2d7dc63abc52

Perplexity AI。（2025年12月2日）。期刊文章文後參考文獻羅馬化的優點〔生成式AI交談〕。Perplexity Pro。https://www.perplexity.ai/search/qi-kan-wen-zhang-wen-hou-can-k-sEjmA.BdSA6_u6cRlETMlQ#0

[2] 此「交談標題」類似對AI之首次提問（prompt），無需呈現歷次細化提問與互動細節，字數雖未限定但仍以易於編輯標題與理解為考量。

[3] 若作者認為公開「交談標題」（提問內容）及其歷次對話與具體的詳細網址，都無關於於讀者掌握閱讀與理解意義；或於論文「研究方法」內僅提及研究設計，例如述及：「我使用了生成式人工智慧（AI）工具 Claude 3.7 Sonnet（Anthropic，2025），產生了一份高中生在12年級結束時應該掌握的語法概念列表。」則可僅只揭露AI工具之使用即可，而不需呈現「交談標題」，且網址亦僅及於AI工具官網即可。此範式為：AI公司名稱。（年份）。*AI*工具名稱/模型（英文Italic，首字母大寫；中文則用標楷體）[大型語言模型]。工具網址。資料詳見APA官方部落格文章Citing generative AI in APA style: Part 1—Reference formats. APA Style, https://apastyle.apa.org/blog/cite-generative-ai-references。

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㈡ Chicago格式（18th ed.）與Turabian Manual

【內文敘述 In-Text Description **】**

當作者於論文中使用AI生成文本時，必需明確表明AI工具之使用。例如：

中文例句：

……以下有關學術期刊出版透明度中的同儕評審過程之重要性敘述是於2025年12月2日由Claude Sonnet 4.5生成：

> 同儕評審是學術出版的核心機制，其透明度直接影響研究品質的把關。傳統的匿名評審雖然保護評審者，但也可能產生偏見或不負責任的評論。越來越多期刊開始採用開放式同儕評審，公開評審者身份和評審意見這不僅提高評審品質，也讓讀者能更全面地評估研究成果。透明的評審過程還能幫助年輕學者學習如何進行建設性的學術批評。[10]

英文例句：

…. The following content about plagiarism as academic misconduct was generated on December 2, 2025, by Gemini 3 Pro: “Plagiarism: Plagiarism involves presenting someone else’s work, ideas, or words as your own without proper acknowledgment. It is not limited to copying text; it also applies to code, images, and data.” [14]

【對應上例，註釋 Note **呈現方式** Formatting of Notes **】**

[10] 由Claude Sonnet 4.5生成的文本，Anthropic，2025年12月2日，https://claude.ai/share/8a8ed4ba-a16d-4ebb-8830-f1813a17db7c。

[14] Text generated by Gemini 3 Pro, Google, December 2, 2025, https://gemini.google.com/share/d5d63287d55d.

此外，作者也可以將自己下達AI的提問（prompts）內容列出於文內，或者將其列於註釋（note）裡。若有多次細化提問時，則這些提問文字扼要摘錄即可。例如文內陳述「提問」：…。本研究以AI工具提問「請解釋該如何製作一般家庭式配方的披薩麵糰？」（…. We have tried to ask AI to explain how to make pizza dough from common household ingredients ？）。

但是，若提問（prompt）標題未包含在文本中，則可以在註釋中呈現；而已再行編輯AI生成的文本，則應於文本中或註釋結尾說明（例如：「已作樣式與內容之編輯」“edited for style and content”）。但不需要說明任何有關引號或字體的變動；這些更改可以默默施加，而無須說明（見CMOS 13.7和13.8）。例如：

英文：

[18] Response to “Explain how to make pizza dough from common household ingredients,” OpenAI, March 7, 2023. edited for style and accuracy.

中文：

[18] 對「解釋如何用製作一般家庭式配方的批薩餅麵團」的回應，OpenAI，2023年3月7日。已重做格式編輯與檢視正確性。

【參考書目範例 Bibliography Examples **】**（注意：不適用於期刊投稿）

若作者想將AI提問與對話內容呈現於文末的「參考書目（bibliography）」時，則使用出版者/開發商之名稱，而勿採該AI工具名；但需列出該資訊之連結網址。

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Bibliography

Anthropic. Response to “The importance of peer review processes in academic journal publishing transparency?” Claude Sonnet 4.5, December 2, 2025. https://claude.ai/share/8a8ed4ba-a16d-4ebb-8830-f1813a17db7c.

參考書目

Anthropic. 提問「學術期刊出版透明度中的同儕評審過程之重要性？」之回應。Claude Sonnet 4.5，2025 年 12 月 2 日，https://claude.ai/share/8a8ed4ba-a16d-4ebb-8830-f1813a17db7c。

二、文章末尾之「致謝與聲明（Acknowledgment and Declaration）」

【範式聲明 Template Statement **】**

致謝與聲明

在本文撰寫過程中，作者為了[某種原因]而使用[工具/服務名稱]。使用此[工具/服務]之後，作者已根據需要再進行審視與編輯該內容，並對此發表之內容擔負起全部責任。

Acknowledgment and Declaration

During the preparation of this work the author(s) used [NAME TOOL / SERVICE] in order to [REASON]. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

【聲明範例 Statement Example **】**

致謝與聲明

在本文撰寫過程中，作者為了長摘要之英文翻譯需求，而使用ChatGPT 4o。使用此工具之後，作者已進行審視並編修，且對此發表之內容擔負起全部責任。

Acknowledgment and Declaration

During the preparation of this work, the authors used ChatGPT 4o for investigation in managing interview transcripts. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the final content of the publication.

參考來源：

Elsevier. (2025, July 29). *How do I submit a manuscript in Editorial Manager?* https://www.elsevier.support/publishing/answer/how-do-i-submit-a-manuscript-in-editorial-manager

McAdoo, T., Denneny, S., & Lee, C. (2025, September 9). *Citing generative AI in APA style: Part 1—Reference formats. APA Style*. https://apastyle.apa.org/blog/cite-generative-ai-references

McAdoo, T., Denneny, S., & Lee, C. (2025, September 9). *Citing generative AI in APA style: Part 2—AI as a search engine and AI integrated into common software*. APA Style. https://apastyle.apa.org/blog/cite-generative-ai-search-software

University of Chicago Press. (2025, December 5). *The Chicago Manual of Style online*. https://www.chicagomanualofstyle.org/home.html

附　錄

JoEMLS 註釋（Notes）暨參考文獻（References）羅馬化英譯說明

2015年1月31日修訂

1. 本刊針對部分國外西文專業資料庫之引文索引建檔與中文辨讀之需求，凡屬中文稿件之英文摘錄末，特別增列中文羅馬化拼音之「註釋」（或「參考文獻」）一式。
2. 作者（含團體作者）、機構名稱（出版者）、地名（出版地）：依事實與習慣為英譯，如無法查證時，中國大陸地區作者以漢語拼音處理，台灣以威妥瑪拼音（Wade-Giles system）處理。
3. 出版品、篇名：採用（登載於原刊名、篇名等之正式英譯）照錄原則；若原刊文無英譯，則由本刊依漢語拼音音譯著錄之。
   e.g. 南京大學學報 *Journal of Nanjing University*
   e.g. 中國科學引文數據庫 *Chinese Science Citation Database*
   e.g. 玉山國家公園解說志工工作滿足之研究 *Yushan National Park jieshuo zhigong gongzuo manzu zhi yanjiu*
   e.g. 教育資料與圖書館學 *Journal of Educational Media and Library Sciences*
4. 混用狀況：地名、機構、人名與其他事實描述，交錯共同構成篇名之一部分時，為避免冗長拼音難以辨讀，可將該名詞中之「地名、機構、人名」依事實與習慣英譯，其餘字詞則由本刊補以漢語拼音處理。
   e.g.「中國科學院與湯姆森科技資訊集團聯手推出中國科學引文索引」
   "Chinese Academy of Sciences yu Thomson Scientific Lianshou Tuichu *Chinese Science Citation Database*"
5. 本刊文章註釋（Notes）或參考文獻（References）羅馬化英譯規則，仍遵循Chicago（Turabian）或APA之精神及原則，進行必要且相對應之編排處理。**此羅馬化作業屬權宜措施，不可取代原有正式之引文規範。**
6. 羅馬化範例：
   範例1 －註釋（Notes）
   林信成、陳瑩潔、游忠諺，「Wiki協作系統應用於數位典藏之內容加值與知識匯集」，教育資料與圖書館學 43卷，3期（2006）：285-307。【Sinn-Cheng Lin, Ying-Chieh Chen, and Chung-Yen Yu, "Application of Wiki Collaboration System for Value Adding and Knowledge Aggregation in a Digital Archive Project," *Journal of Educational Media & Library Sciences 43*, no. 3 (2006): 285-307. (in Chinese)】
   範例2 －參考文獻（References）
   林雯瑤、邱炯友（2012）。教育資料與圖書館學四十年之書目計量分析。教育資料與圖書館學，*49*(3)，297-314。【Lin, Wen-Yau Cathy, & Chiu, Jeong-Yeou (2012). A bibliometric study of the *Journal of Educational Media & Library Sciences,* 1970-2010. *Journal of Educational Media & Library Sciences*, *49*(3), 297-314. (in Chinese)】

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The main purpose of Romanized and Translated Notes (or References) at the end of English Summary is to assist Western database indexers in identifying and indexing Chinese citations. This Romanization system for transliterating Chinese cannot be a substitute for those original notes or references listed with the Chinese manuscript. The effect of Chinese Romanization for citation remains to be seen.

附 錄

教育資料與圖書館學 投稿須知

一、 教育資料與圖書館學（以下簡稱本刊）秉持學術規範與同儕評閱精神，舉凡圖書館學、資訊科學與科技、書業與出版研究等，以及符合圖書資訊學應用發展之教學科技與資訊傳播論述。均所歡迎，惟恕不刊登非本人著作之全譯稿。

二、 本刊為不向投稿者及作者收取文章處理費（article processing charge，APC）之開放取用期刊，且採雙盲同儕評閱審查制度，現由淡江大學出版中心出版，淡江大學資訊與圖書館學系和覺生紀念圖書館合作策劃編輯，一年共出版三期（3月、7月、11月）。

三、 賜稿須為作者本人之首次發表，且未曾部分或全部刊登（或現未投稿）於國內外其他刊物，亦未於網路上公開傳播。此外，保證無侵害他人著作權或損及學術倫理之情事。

四、 文章刊載內容之文責由作者自負，作者應對文章所有內容之準確性負責。文章刊載內容及出版並不代表本刊立場，本刊將在能力範圍內致力確保刊載內容之準確性。來稿內容所引用之文獻資料須註明出處，採用他人照片、圖表、數據等著作權及所有權問題，作者應先取得書面授權。若使用生成式AI內容，請參閱本刊生成式AI之自我揭露與誠信原則。

五、 作者同意其投稿之文章經本刊收錄後，即授權本刊、淡江大學覺生紀念圖書館、淡江大學資訊與圖書館學系，為學術與教學等非營利使用，進行重製、公開傳輸或其他為發行目的之利用。

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七、 本刊作者仍保有刊登文章之著作權。除此之外，讀者可採用CC創用4.0國際CC BY-NC（姓名標示-非商業性）之方式使用本刊文章。

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⑵ 短文論述（Brief Communications）中文字數須不少於4,000字，英文約2,500字為宜。

⑶ 觀察報告（Observation Reports）中文字數約為8,000字以上，英文則為4,000字以上為宜。

⑷ 書評（Book Review）中文約為3,000至6000字，英文則為2,000字以上為宜。

⑸ 給主編的信（Letters to the Editor）則以評論與回應本刊所登文稿或揭示新進重要著作與發現為旨趣，中英文均以1,500字為度。

本刊編務團隊得視實際稿件內容與撰寫情況，適度建議作者增減字數，以利編輯處理與刊載品質。

九、 圖書資訊學域因具科際整合之實，為尊重人文社會學研究之差異性，故採芝加哥Note格式（Chicago-Turabian Style）或美國心理學會Author-date格式（APA format），敬請擇一遵守。賜稿註釋或參考資料格式務請明確詳實，相關引文格式來函備索或參見本刊網頁。

十、 中文投稿內容應包括中英文題名、中英文摘要（三百字以內為原則）、中英文關鍵詞（各6個以內）、圖與表合計不超過16個、附錄不超過5個為原則，並請附作者中英文之姓名、職銜、服務機關與所屬部門、電子郵址。若為非中文投稿者，可僅提供上述各項英文資訊。

十一、 賜稿為多人共同著作時，請以排序第一作者為「最主要作者」；並得指定同一人或另一人為稿件聯繫與學術交流之「通訊作者」及作者群之順序。若為學位論文或會議論文改寫，刊登時需於文章首頁附註說明。

十二、 本刊實施稿件雙盲同儕評閱制度，作者於本刊要求稿件修訂期限內，務必完成修訂稿回擲，逾期者將被視為退稿；逾期修訂稿可視同新遞稿件，由本刊重啟初始評閱流程。

十三、 為提高刊登稿件之英文可讀性，中文賜稿獲本刊通知接受將予刊登之時，必須再行繳交1,200字至1,500字之英文摘錄（English Summary）含適當引註以及「捷點」（InSight Point）導讀簡報，始予刊登。作者必須信實對應本文，精簡呈現中文稿件所刊載之English Summary與捷點（InSight Point），並負起相關文責，俾利外語讀者之參考與引用。

十四、 本刊編輯端保有文字修正與潤稿之權力，並為您提供English Summary末之中文引用文獻的羅馬拼音暨翻譯服務，以利部份西文專業資料庫之引文索引建檔與中文辨讀之需求。此羅馬化作業屬權宜措施，不可取代原有正式之引文規範。

十五、 本刊接受書評專文，亦歡迎書評書籍之推薦，相關細節請洽本刊編輯（joemls@mail2.tku.edu.tw）。

十六、 賜稿刊登恕無稿酬，惟僅贈該期紙本一份予通訊作者。作者亦可透過本刊網頁之Open Access機制取得PDF版全文。

十七、 賜稿請利用本刊ScholarOne投稿評閱系統（https://mc.manuscriptcentral.com/joemls）俾利作業處理與完整建檔。特殊情況，得將全文Word或RTF格式檔案寄至本刊電子信箱（joemls@mail2.tku.edu.tw）。

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